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VIRGINIA ACADEMY OF SCIENCE

PROCEEDINGS FOR THE YEAR

1949 -- 1950

Vol. 1, New Series SEPTEMBER, 1950 No. 4

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VOL. I, NEW SERIES No. 4

VIRGINIA ACADEMY OF SCIENCE

Proceedings for the Year 1949 - - 1950

MINUTES OF THE TWENTY-EIGHTH ANNUAL MEETING
MAY 11, 12, 13, 1950

ROANOKE, VIRGINIA

LIST OF PRESIDENTS

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JAMES LEWIS HOWE	1924-25
ROBERT E. LOVING	1925-26
*J. SHELTON HORSLEY	1926-27
*DONALD W. DAVIS	1927-28
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GARNETT RYLAND	1929-30
L. G. HOXTON	1930-31
I. D. WILSON	1931-32
T. MCN. SIMPSON, JR.	1932-33
WILLIAM A. KEPNER	1933-34
WILLIAM T. SANGER	1934-35
IDA SITLER	1935-36
H. E. JORDAN	1936-37
D. MAURICE ALLAN	1937-38
EARLE B. NORRIS	1938-39
RUSKIN S. FREER	1939-40
*WORTLEY F. RUDD	1940-41
GEORGE W. JEFFERS	1941-42
MARCELLUS H. STOW	1942-43
*W. CATESBY JONES	1943-44
ROBERT F. SMART	1944-45
H. RUPERT HANMER	1945-46
ARTHUR BEVAN	1946-47
JESSE W. BEAMS	1947-48
SIDNEY S. NEGUS	1948-49
BOYD HARSHBARGER	1949-50
GUY W. HORSLEY	1950-51
PAUL M. PATTERSON	1951-52

*Deceased

Virginia Academy of Science

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LOCAL ARRANGEMENTS—1950 MEETING, MAY 11-13

Roanoke Hotel, Roanoke

HOST INSTITUTIONS: Hollins College and Roanoke College
P. M. Patterson, Chairman, Hollins College
Ashley Robey, Co-Chairman, Roanoke College

Meeting Rooms and Projection Equipment ..... John D. Schumacher
Registration ..... Harriett H. Fillinger and Herta Taussig
Housing ..... C. Lucian Crockett, Mrs. J. F. Prufer, and R. Rush Anderson
Publicity ..... Kenneth Hood and Willard N. James
Exhibits ..... Helen Churchill and C. H. Raynor
Annual Dinners ..... Cecile Finley and Thomas C. Capraro
Guest Speakers ..... D. R. Carpenter
Reception ..... Louise Maddrey and Nellie Manges
Tours ..... D. R. Carpenter
Junior Academy ..... Thomas C. Capraro
  Registration ..... Theodore W. Gibson
  Exhibits ..... C. H. Raynor
  Fifth Virginia Science Talent Search ..... Molly T. Denton

ACADEMY COMMITTEES APPOINTED BY PRESIDENT HORSLEY FOR 1950-1951

Officers of Academy will be ex-officio members of all committees

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(Elected by Sections)

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	Mary E. Humphreys	

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(Elected by Sections)

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J. Douglas Reid ..... Bacteriology
Ladley Husted ..... Biology
William E. Trout, Jr. ..... Chemistry
Francis G. Lankford, Jr. ..... Education
Nelson F. Murphy ..... Engineering
Nelson Cooper ..... Geology
William Bickers ..... Medical Sciences
Richard H. Henneman ..... Psychology
L. W. Jarman ..... Science Teachers
Walter Hendricks ..... Statistics

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Virginia Polytechnic Institute, Blacksburg

Sidney S. Negus (1952) Jesse W. Beams (1951)

RESOLUTIONS

William E. Trout, Chairman

University of Richmond, Richmond

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Jefferson Medal Winners

RECIPIENTS OF THE JEFFERSON GOLD MEDAL[1]

Alfred Chanutin 1936
William B. Porter 1937
H. M. Phillips 1938
G. M. Shear and H. D. Ussery 1939

RECIPIENTS OF THE JEFFERSON PRIZE[2]

L. G. Overholzer and John H. Yoe 1940
Allan T. Gwathmey 1941
R. N. Jefferson 1942
W. H. Hough 1943
Clinton B. Cosby 1944

Recipients of J. Shelton Horsley Research Awards

CARL C. SPEIDEL 1927
JOHN H. YOE 1928
J. C. STREET 1929
H. E. JORDAN
CARL C. SPEIDEL 1930
E. C. STEVENSON 1931
JAMES H. SMITH 1932
S. A. WINGARD 1933
E. P. JOHNSON 1934
MARGARET HESS 1935
ALFRED CHANUTIN 1936
R. G. HENDERSON 1937
S. G. BEDELL 1938
M. J. MURRAY
F. F. CLEVELAND 1939
WALTON C. GREGORY 1940
CHARLES RAY 1941
NO AWARD 1942
J. B. MEYER 1943
J. H. TAYLOR 1944
NO AWARD 1945
BOYD HARSHBARGER
D. B. DELURY (separate papers) 1946
NO AWARD 1947
HENRY LEIDHEISER, JR. 1948
WALTER S. FLORY, JR. 1949
ERLING S. HEGRE 1950

1 The winning papers in this competition were entered against those of the North Carolina, South Carolina, Georgia and Florida Academies of Science. It was discounted in 1940.

2 The winning authors had the choice of the Jefferson Prize or the Academy Prize during this period. The name of the Academy Prize was changed to the J. Shelton Horsley Award; and the Jefferson Prize discontinued in 1944.

General Program of the Twenty-eighth Annual Meeting

1950

WEDNESDAY, MAY 10, ROANOKE COLLEGE

SALEM, VIRGINIA

3:00 P. M.—Registration at the College for Junior Academy members and participants in the Science Talent Search, Entrance Hall, Physics Building.

THURSDAY, MAY 11, ROANOKE COLLEGE

SALEM, VIRGINIA

8:00 A. M. to 9:00 A. M.—Registration at the College for Junior and Senior Scientists and Guests, Entrance Hall, Physics Building.

8:00 A. M. to 9:00 A. M., May 12—Display of Science Exhibits, Rooms 1, 2, and 11, Physics Building.

10:30 A. M.—Participants in the Science Talent Search meet with P. C. Scherer in Room 12, Lucas Chemistry Building.

10:30 A. M.—Participants in the Science Exhibit Contest meet with F. S. Andrews and B. N. Cooper, Room 12, Physics Building.

11:00 A. M. to 4:30 P. M.—Judging of those entering the
(a) Science Talent Search, Rooms 7, 17, and 27, Lucas Chemistry Building.
(b) Science Exhibit Contests, Rooms 1, 2, and 11, Physics Building.

12:30 P. M.—Radio Program

1:00 to 6:00 P. M.—Registration of Senior Scientists at Hotel Roanoke for those not able to register at Roanoke College, Colonial Room.

2:00 P. M.—Annual Business Meeting of the Junior Academy of Science, Room 12, Lucas Chemistry Building.
Invited Lecturer: Professor Andrew Murphy, Roanoke College, "Chemistry as a Vocation".
Business Meeting.

3:00 P. M.—Meeting of the editors of the Virginia Journal of Science in Room 22, Lucas Chemistry Building.

4:00 P. M.—Meeting of the Council of the Senior Academy in Room 25, Lucas Chemistry Building.

5:00 P. M.—Meeting of the Officers of the Sections in Room 22, Lucas Chemistry Building.

6:30 P. M.—Junior Academy Dinner at Roanoke College, Commons Dining Room. Participants in the Science Talent Search and Science Exhibit Contests will be the guests of Roanoke College. Senior members are urged to attend this dinner. A charge of $1.50 will be made.

Presiding—Arthur R. Giesen, Jr., President of the Junior Academy.

Greeting—Boyd Harshbarger, President of the Academy.

Welcome—H. Sherman Oberley, President of Roanoke College.

Presentation of Junior Academy Awards—F. S. Andrews, B. N. Cooper.

Presentation of Virginia Science Talent Search Awards—P. C. Scherer.

Address—Walter S. Flory, Vice-Director, Blandy Experimental Farm of the University of Virginia, "Science and Technology".

8:00 P. M.—Panel Discussion for Juniors.

8:00 P. M.—Academy Conference and General Meeting, Laboratory Theater.

Presiding—Boyd Harshbarger, *President*

Reports of Officers

Reports of Committees

Constitution Committee—Sidney S. Negus, *Chairman*
By-Laws Committee
Long Range Planning—Lloyd C. Bird, *Chairman*
Research Committee—H. Rupert Hanmer, *Chairman*
Finance and Endowment—Guy W. Horsley, *Chairman*
Junior Academy of Science—F. S. Andrews and B. N. Cooper, *Co-Chairmen*
Speakers Bureau—Frank C. Vilbrandt, *Chairman*
Virginia Science Talent Search—P. C. Scherer, *Chairman*
Activities for Collegiate Members—Joe W. Guthridge, *Chairman*
Resolutions Committee—J. Gordon Stipe, Jr., *Chairman*
Exchange of Foreign Students — J. Edgar Fisher, *Chairman*
Membership—Foley F. Smith, *Chairman*
James River Project—Marcellus H. Stow, *Chairman*
Resource-Use Education—Alfred L. Wingo, *Chairman*
Virginia Flora—A. B. Massey, *Chairman*
Virginia Fauna—Horton H. Hobbs, *Chairman*
Virginia Journal of Science—Horton H. Hobbs, *Technical Editor*

Science Museum—George W. Jeffers, *Chairman*
Place of Meeting for 1951—Horton H. Hobbs, *Chairman*
Local Arrangements—P. M. Patterson, *Chairman*
Institute for Scientific Research — Allan T. Gwathmey, *Chairman*
New Business

FRIDAY, MAY 12, THE HOTEL ROANOKE
ROANOKE, VIRGINIA

8:00 A. M.—Registration in the Colonial Room.

9:00 A. M.—Section Meetings.
Agricultural Sciences, Parlor H
Astronomy, Mathematics, and Physics, Parlor A
Bacteriology, Parlor L
Biology, Parlor B
Chemistry, Ballroom
Education, Parlor K
Engineering, Writing Room next to Pine Room
Geology, Parlor F
Medical Sciences, Parlor D
Psychology, Pine Room
Science Teachers, Board Room, N. & W. Office Building
Statistics, Parlor E (Saturday, Parlor F)

10:00 A. M.—Industrial Tour for Junior Academy members, subject to its being elected by a sufficient number of Juniors.

12:30 P. M.—Radio Program.

12:30 P. M.—Luncheon for members of collegiate chapters and other collegiate members (see bulletin board for place).

12:30 P. M.—Group Luncheons.

2:00 to 4:00 P. M.—Section Meetings.

4:00 P. M.—Section meetings adjourned. Junior and Senior members of the Academy to be guests at a reception at Hollins College in their honor.

7:30 P. M.—Academy Dinner, Ballroom. Tickets must be obtained at the registration desk by Friday noon. Dress, informal.
Presiding—Boyd Harshbarger.
Welcome—Bessie Carter Randolph, President, Hollins College.
H. Sherman Oberley, President, Roanoke College
Presentation of J. Shelton Horsley Research Award.
Report of Nominating Committee.
Report of Committee on Resolutions.
Report of Place of Meeting Committee.
Installation of Officers for 1950-51.

8:30 P. M.—Address—Russell S. Poor, Chairman, University Relation Division, Oak Ridge Research Institute of Nuclear Studies.
"The Impact of Atomic Energy on Southern Education"

SATURDAY, MAY 13, THE ROANOKE HOTEL
ROANOKE, VIRGINIA

9:00 A. M.—Section Meetings.

10:00 A. M.—Statistics, Parlor F.

10:00 A. M.—Academy Council Meeting, Parlor K.

2:00 P. M.—Field Trips (see bulletin boards for further information).

President's Address at the Academy Conference Roanoke College, May 11

Members of the Virginia Academy of Science:

Before summarizing the work of the Academy for this past year, I wish to express my appreciation to the Local Arrangements Committee. They have excelled in all fields of work including arrangements for the Juniors, in procuring section rooms and equipment, in furnishing clerical help, and in providing entertainment for the entire membership. My thanks also go to the Council, the other officers and all of the standing committees of the Academy. To the host institutions, Roanoke College and Hollins College, our praise and thanks for making this meeting in Roanoke possible. Every member of the Academy, including the Juniors, owes them a debt of gratitude.

It is appropriate that the president give an account of his stewardship and make some remarks on the "Steps of Progress and Roll of the Academy."

1. *Membership*—The membership of the Academy is now at an all-time high. This year, as of March 31, we had added 180 members, making a total of 910 paid members. Last year's total was 730 paid members. This increase has not come about by mere chance. The president's office has communicated with over 400 people either by letter or by person. One of the duties of the office was to write to each of the committees urging them to exert influence in the direction of obtaining new members. The office wrote all new members of the science faculties as furnished by the deans of the various colleges of the State and extended to them a personal invitation to join the Academy. The office also wrote to and talked with representatives of industry regarding membership. The Membership Committee has been active in getting new members and the same is true of most of the members of the Academy.

The most important influence in getting members seems to have been the promise of receiving, for their dues, the Virginia Journal of Science. Many old members who were considering dropping their memberships decided to reconsider once they were promised the Journal or when they received their first copy. Similarly, others upon seeing the Journal decided that they wished to become members of the Academy.

The secretary sent out bills in the early fall and then followed up with second and third notices. This, as explained by the secretary, was essential if we were to continue sending the Journal to the entire membership. To those who had not paid their dues before the third mailing

of the bills, the second issue of the Journal was not sent unless we received their remittance.

2. *Research*—Through the Committee on Scientific and Economic Research of the Council of the Virginia Economy, a subcommittee composed of Academy members has been set up to prepare a brochure for attracting research institutes and research laboratories to the State. The increase in the number of research institutes and research laboratories in the State will enable more of our highly trained young men to remain in Virginia, and will even attract well-trained personnel from other states.

The 226 papers to be submitted at the meetings on Friday and Saturday speak for the progress of individual research to which the Academy is dedicated.

3. *The Virginia Journal of Science*—In the early summer of 1949, Dr. Lewis wrote to all the members requesting that they do two things—"join with many of us in undertaking to pay the sum of two dollars a year for two years by signing and returning the enclosed card" and "give serious thought to doing even more than your share by taking out a higher bracket membership and becoming a Contributing Member at five dollars, or a Sustaining Member at ten dollars with the stipulation that the excess of your payment over the regular three dollar membership may be used for the next two years for support of the Journal."

A follow-up letter was sent by the president on September 9 again concerning contributions to the Journal. From these requests 13 members raised their membership to sustaining, 43 members became contributing members, 19 paid their pledges for two years and 339 others pledged to pay $2 for each of the next two years. Mr. Goethe gave $10, one member gave $5 and two members, $3. It had been adopted at the meeting of the Council in Charlottesville, and so stipulated in Dr. Lewis's letter, that this sum of money contributed by the members was to be used as a backlog for the Journal and should be kept intact unless an emergency arose. On behalf of the Academy, I wish to thank this very large segment of the membership for their interest and fine support of the Journal. I personally consider this spontaneous response and support as the highlight of my administration.

Following this successful campaign for funds, the Academy began in January the publication of the Virginia Journal of Science, New Series.

4. *Committees of the Junior Academy and Science Talent Search*—These two committees have carried through their work in a manner which deserves praise from the entire Academy. Listed as one of the objectives for this year was a study of the science teaching in Virginia High Schools. This will be reported on during this session.

5. *The James River Monograph*—This topic will be more fully treated at the annual dinner tomorrow night. It will suffice here to re-

mark that the publication of this work is an accomplishment unique in America. The authors and Committee deserve our highest praise.

6. *Collegiate Chapters*—A movement by a group of students at the Virginia Military Institute, headed by Mr. Lyons and Mr. Mitchell, this last year formulated plans for collegiate chapters affiliated with the Virginia Academy of Science. This movement has now spread to other colleges throughout the State, and at the Council meeting this afternoon, chapters from Virginia Military Institute and Virginia Polytechnic Institute were approved by the Council. This movement, which had its beginning here in Virginia is now a national movement being carried on by many of the state academies. In states where no state academy exists, the American Association for the Advancement of Science will undertake the formation of collegiate chapters.

The American Association for the Advancement of Science is making available this year honorary membership for two of the most outstanding collegiate chapters in the Virginia Academy of Science. This will be an annual award. It includes a subscription to the "Scientific Monthly" which will be most valuable to a collegiate chapter.

7. *Meeting Place*—The Academy should seriously consider again meeting at colleges. In the college atmosphere more profound thinking can be accomplished and the temptation to make the atmosphere of the Academy meetings one of a convention, rather than a scientific gathering, is eliminated. In many respects, the space for section meetings is more adequate at institutions of higher learning. By the Academy's meeting at a college, it leaves there a greater respect for science.

8. *Cooperation with Institutions of Higher Learning and Industry*—Without the help of institutions of higher learning in providing clerical help and in allowing their staffs to devote time to the Academy, we could not continue. In this way institutions of higher learning serve their purpose in fostering research and promoting the spread of knowledge in a way which would not be possible if the Academy did not exist. It is a two-way exchange—the colleges help the Academy and the Academy helps the colleges. The Academy is proud of this joint arrangement and wishes to thank the administration of the various colleges and other state agencies throughout the State for making this cooperation possible.

In a similar manner, industry is helping the Academy and we owe them much praise.

As we see, the Academy cooperates with institutions of higher learning and with industry, but at the same time it is not dependent on any group. We chart our course in a free democratic way, and that purpose we must constantly guard and protect. The colleges and industries respect this course of action, and will help us to guard it constantly. With this in mind, it might be wise for the Academy to consider, in the light of our increased office expenditures, more cooperation from colleges.

9. *Constitution and By-Laws*—The Academy has grown from a small state academy to the largest and strongest state academy in America. It is now an organization that handle over $6,000 a year, publishes a Journal, holds meetings, and in a true sense is the mouthpiece of science in Virginia.

I have been keenly conscious this year of the lack of a set of by-laws and a modern constitution outlining the duties and responsibilities of the various offices. This is even more important now that the Academy has again embarked upon the publication of a journal. When we were small we spoke as a child, but now we must accept the responsibilities of a large institution. With this in mind, I appointed Sidney S. Negus, Dr. E. C. L. Miller, and J. L. Blair Buck to revise our constitution, and Walter S. Flory, Ruskin S. Freer, and James W. Cole to prepare a set of by-laws.

The constitution by definition contains:

1. Name and objectives of the society
2. Qualification of members
3. Officers and their election
4. Meetings of the society (including only what is essential, leaving details to the by-laws)
5. How to amend the constitution.

The by-laws include the rules that are of such importance that they cannot be changed without previous notice. They are more flexible than those in the constitution, and in one sense are the true working rules of the organization.

The adoption of a set of by-laws and a modern constitution will be the greatest step for progress that the Academy can make at this meeting.

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Minutes of the Meeting of the Editorial Staff

ALDERMAN LIBRARY, UNIVERSITY OF VIRGINIA

OCTOBER 8, 1949

Present were: Boyd Harshbarger, Francis B. Lankford, Jr., Ivey F. Lewis, Ladley Husted, Richard Henneman, William Trout, Jr., Irving G. Foster, R. E. L. Gildea, and Horton H. Hobbs, Jr.

Mr. Harshbarger gave a report on the response he had received to the letters that had been written to the membership relative to interest in the resumption of publication of the Virginia Journal of Science. At the present time better than 40% of the members have responded favorably as follows:

328 contributed $2.00
49 became Contributing Members
18 became Sustaining Members

395 Total

Mr. Harshbarger also presented a bid from the Graphic Arts Department, Radford News Journal indicating that the cost of publishing the four issues of the Journal would amount to approximately only $110.00 more than the cost of the Proceedings and programs if published in Richmond, as was done last year.

Finances were discussed at length, and Mr. Husted moved that the Council be petitioned to turn over to the Virginia Journal $2.00 for each member of the Academy on the condition that the Journal assume responsibility for the publication of the Proceedings and the Programs for the Annual Meeting. The motion was seconded and passed.

The matter of length of abstracts for the Proceedings was considered, and it was decided that no abstract should exceed 200 words in length.

Mr. Foster moved that a contract for publication of the Journal be awarded to the Graphic Arts Department of the Radford News Journal. The motion was seconded and passed.

It was generally agreed that we should publish the paper winning the Horsley Award each year, and not limit its length to that of other papers.

The matter of the length of the Expository (Lead) Article was raised, and the consensus was that an article of 10-15 pages would be desirable.

Mr. Lewis suggested that in each issue which carried an Expository Article that the photograph of an outstanding man in the field concerned be included in that number of the Journal. Following some discussion it was agreed that this would be desirable should the cost not be prohibitive. No agreement was reached as to how the individual whose photograph is to appear should be chosen.

It was agreed that each Section of the Academy should have made available one page for News and Notes in Nos. 1, 2, and 3 of each volume. Further it was agreed that the President of the Academy have a page for announcements, and in the first issue include a statement concerning the Horsley Award. Also news from chairmen of committees is to be included when it affects the membership.

It was further agreed that the Journal would furnish the author one plate, or its equivalent, and that if additional plates are desired the author may obtain them at cost.

Mr. Husted moved that papers submitted for publication be limited to 2400 words, with the proviso that if additional pages are desired, the author may obtain them at cost. Motion was seconded and carried.

The matter of cost of reprints was discussed, and since the bid supplied by the Radford News Journal relative to reprints was not clear,

Mr. Harshbarger agreed to obtain more explicit information from the printers.

The program for the Annual Meeting was discussed, and it was agreed that it should be published in Number 2 of the Journal, and that 500-600 reprints be purchased for the Meetings. In order that the program be ready for the issue concerned, all titles should be in by March 1, and in the hands of the Technical Editor not later than March 7.

It was the general consensus that the four numbers of the Journal be issued on January 15, April 15, July 15, and September 15 — the latter consisting of the Proceedings.

The present issue (i.e., No. 1) should carry the note that all titles are to be turned in to the Section Secretaries not later than March 1.

Exchange rights for the Journal were discussed at length, and Mr. Husted was appointed as a committee of one to make an agreement with the University of Virginia Library.

It was decided that 1500 copies of the Journal should be printed, and that subscription prices should be $3.00, or individual numbers sold at $1.00 per copy.

Mr. Hobbs presented a tentative plan for the structure of the Journal along with suggestions as to policy relative to Manuscript forms. It was generally agreed that one face of the cover bear a list of the Officers of the Academy and that the News and Notes would appear on alternate pages with advertisements at the back of each number of the Journal.

Mr. Husted and Mr. Hobbs were appointed by the Editor to draw up an attractive cover for the Journal.

Mr. Harshbarger was asked to look into the matter of securing an Advertising Manager for the Journal.

Mr. Lewis brought up the fact that in many of the Academic Exercises in the various colleges and universities in the State the Academy was not represented, and stated that this situation could easily be remedied by writing to members of the Academy who are on the faculties of the various institutions to see that the Academy receive an invitation to be represented at such functions. He agreed to write to Academy members at the six institutions where inaugurations of newly elected (appointed) presidents are to take place within the near future in order that we might secure invitations.

The meeting adjourned at 12:45 p. m.

HORTON H. HOBBS, JR., *Acting Secretary*

Minutes of the Meeting of the Council, May 11

A meeting of the Council of the Senior Academy and invited guests was held at 4:00 p. m. in Room 25, Lucas Chemical Laboratory, Roanoke College, Salem. Present were: President Boyd Harshbarger, presiding; John N. Buck, Edward Harlow, Horton H. Hobbs, Jr., Guy W. Horsley, Ladley Husted, E. C. L. Miller, and Foley F. Smith. Also present were Justus Cline and Marcellus Stow, Chairman of the Long Range Project Committee. First order of business was a discussion of membership by President Harshbarger, who requested that all present make a particular effort to increase all classes of membership in the Academy.

The question of Collegiate or Student Chapters of the Virginia Academy of Science being formed as student affiliates was discussed at length. It was recommended that such chapters pay membership fees to the Academy of $10.00 per year, which would entitle them to two copies per issue of the Virginia Journal of Science. The AAAS offered two memberships in the AAAS to be awarded the two outstanding chapters each year. Free microfilm service was also offered to such chapters by the AAAS. Considerable discussion followed whether members of such chapters would be required to join as student members of the Virginia Academy of Science, or would automatically be student members. It was decided that an attempt be made to get such members to become student members of the Academy, such membership, however, not to be required as a requisite to membership in the Student Chapter.

It was properly moved, seconded, and passed that the Virginia Academy of Science encourage the formation of Collegiate or Student Chapters, with annual dues of $10.00 per year, which entitles the Chapter to receive two copies of the Virginia Journal of Science per issue. Four dollars of such dues will be returned to the Virginia Journal of Science. Any amendments subsequently made to the approved Constitution and By-Laws must be approved by action of the Academy Council.

Proper motion was made, seconded, and passed that the two Constitutions and By-Laws for Collegiate Chapters at Virginia Military Institute and Virginia Polytechnic Institute be accepted with the condition that the Faculty Advisors be required to be members of the Virginia Academy of Science.

The financial report of the Secretary-Treasurer and the report of the Finance and Endowment Committee was discussed in great detail, and it was properly moved, seconded, and passed that the reports be accepted.

The proposed By-Laws were discussed and several changes suggested. However, it was stated that the By-Laws here proposed constituted the first draft, and that the By-Laws to be discussed at the Academy Conference meeting would carry some further changes. There being no further business the meeting adjourned at 5:25 p. m.

FOLEY F. SMITH, *Secretary.*

Minutes of the Academy Conference

The Academy Conference convened in the Laboratory Auditorium, Roanoke College, Salem, 8:30 p. m., May 11, 1950. Approximately 75 Academy members were present. President Harshbarger presided, and first called on Hubert J. Davis for a report on the First Annual Tidewater Fair, conducted by Science Teachers of Tidewater Virginia, and sponsored by the Norfolk Ledger-Dispatch, April 22-25, 1950.

The President expressed the official thanks of the Academy to the Committee on Local Arrangements and to the Host Institutions. The Committee reports which follow were all formally accepted for inclusion in the Annual Proceedings.

REPORT OF THE TIDEWATER SCIENCE FAIR

The idea of a science fair is not new. The first attempt to sponsor a science fair by any city in the southeastern part of the United States was made by the Ledger-Dispatch of Norfolk, Virginia.

The steering committee consisted of one representative from each of the twelve school divisions involved, and each committee member was given the authority to appoint his own subcommittee. This resulted in approximately a hundred teachers and pupils participating in the fair. Each committee member was assigned full responsibility for ane particular phase of the science fair. This plan proved to be workable.

An executive committee consisting of representatives from the sponsoring paper and the three larger school divisions met often and administered the activities which did not require the approval of the larger committee.

The following seven committees were organized:

a. The Promotion Committee which was composed of the managing editor and promotion manager of the newspaper;
b. The Executive Committee which found it necessary to assume responsibility for many activities because of our lack of experience in conducting a science fair;
c. The Forms Committee which after obtaining and examining the printed forms used by other science fairs prepared those used in this fair;
d. The Awards Committee which planned ways and means of raising money for the awards and distributing them to the winners, and which raised more than one thousand dollars;
e. The Exhibit Committee which received the entry blanks, passed upon the eligibility of the exhibits, assigned space, and procured tables; and
f. The Judging Committee which selected forty qualified persons who agreed to judge the exhibits.

The Tidewater Science Fair was well received by the public and the school people, and we have been assured of the sponsorship of the Tidewater Science Fair another year. We also have been asked to invite, through you, any community in Virginia to participate in a larger tournament type fair, which would be a preliminary for selecting winners to represent Virginia in the National Science Fair. This has been approved by Science Service. We have also been promised the National Science Fair at Norfolk in 1952 .

HUBERT J. DAVIS

REPORT OF SECRETARY-TREASURER

The Academy has enjoyed an outstanding year. Two highly significant events have served to increase the prestige of the Academy, and will continue to do so. One was the reestablishing of the Virginia Journal of Science, following the adoption of the report of the Journal Committee, chairmaned by Mr. Ladley Husted, under the direction of a very capable Editorial Board headed by Mr. Boyd Harshbarger, Editor-in-Chief, Mr. Horton H. Hobbs, Jr., Technical Editor, and the many others who have worked and served on the Editorial Board. Each section of the Academy is represented by an editor on this Board, so that the entire Academy is contributing through them to this excellent publication.

The second was the long awaited publication of the James River Monograph; "The James River Basin—Past, Present aand Future" has finally reached completion. This very excellent book is the result of the excellent work done by the James River Project Committee, under the Chairmanship of Mr. Marcellus Stow. It can now be seen and obtained at this meeting. Further details of both of these events will be contained in the reports of the respective committees.

The Academy has been duly represented at many outstanding events, and I think that these should be enumerated:

Mr. Gustav Hedlund represented the Academy at the 100th meeting of the Connecticut Academy of Arts and Sciences at Yale University, November 4, 1949. President Harshbarger represented the Academy at the Virginia Teachers' Association held in Richmond in November; inauguration of Mr. G. Tyler Miller, President of Madison College; inauguration of campaign for a new science building at Bridgewater College; inauguration of Mr. H. Sherman Oberley, President of Roanoke College, in 1950, and the inauguration of Mr. Orville Wake, President of Lynchburg College, April 25, 1950. The Academy was represented by your Secretary at the inauguration of Mr. Walter Newman, President of Virginia Polytechnic Institute in 1949. President Harshbarger and the Secretary represented the Academy at the Academy Conference held in connection with AAAS in New York in December, where a very high honor was conferred upon the Academy when Mr. Harshbarger was elected President of the Academy Conference for the year 1950. Mr. Walter S. Flory represented the Academy at the inauguration of Mr. Warren D. Bowman, President of Bridgewater College in 1950.

The Council has officially met several times since the 1949 meeting in May; once with the Editorial Staff of Virginia Journal of Science at the Colonnade Club, University of Virginia, June 19, 1949, the minutes of which are contained in the Proceedings of 1948-1949. The Editorial Staff also met at the Alderman Library, University of Virginia, October 8, 1949, and the Council and Editorial Board met at the Medical College of Virginia, November 4, 1949. Minutes of this meeting appeared in the first issue of the Virginia Journal of Science.

All of the committees have been active as will be seen from the individual reports which will follow.

The Constitution Revision Committee presented their recommendations in the April issue of the Virginia Journal of Science and action will be taken on this and the By-Laws.

The financial condition of the Academy is contained in the Auditor's report which will be discussed in detail in the report of the Finance and Endowment Committee, and will be printed in full in the Proceedings of the Academy, i.e., the September issue of the Virginia Journal of Science

FOLEY F. SMITH, *Secretary-Treasurer*

Richmond, Virginia
April 19, 1950

The Officers and Council Members
Virginia Academy of Science
Richmond, Virginia

Gentlemen:

I have prepared from the Secretary-Treasurer's books of account and record of

VIRGINIA ACADEMY OF SCIENCE, RICHMOND, VIRGINIA

the statements listed in foregoing index covering the activities for the period April 16, 1949, to March 31, 1950, inclusive.

The Statement of Cash Receipts and Disbursements, Exhibit "B" reflects the General Fund cash transactions for the period April 16, 1949, to March 31, 1950, inclusive. The Statement of Cash Receipts and Disbursements, Exhibit "C" reflects the Research Fund cash transactions for the period April 16, 1949, to March 31, 1950, inclusive. The cash in bank was verified by direct correspondence with the depository bank and reconciliation of the balances reported with the amount shown on the Consolidated Fund Balance Sheet, Exhibit "A".

The figures shown on the Consolidated Fund Balance Sheet, Exhibit "A" for the Trust Fund Income Account and Trust Fund Principal Account were taken from the March 31, 1950 report of the Trust Agent, First and Merchants National Bank of Richmond, as well as the figures

shown on the related Statements of Cash Receipts and Disbursements, Exhibits "D" and "E", respectively, and with the exception of cash were not verified in any manner.

Respectfully submitted,
J. WADDELL RISON, *Accountant*

VIRGINIA ACADEMY OF SCIENCE

RICHMOND, VIRGINIA

CONSOLIDATED FUND BALANCE SHEET

MARCH 31, 1950

(Prepared from Records without Audit or Verification)

EXHIBIT "A"

ASSETS

GENERAL FUND:			
Cash in Bank (Exhibit "B")		$ 2,995.52	
Total General Fund			$ 2,995.52
RESEARCH FUND:			
Cash in Bank (Exhibit "C")		$ 658.61	
Total Research Fund			658.61
TRUST FUND—INCOME ACCOUNT (See Foot Note):			
Investment (At Cost):			
Preferred Stocks (Market Value $1,708.00)		1,790.85	
Total Trust Fund Income Account			1,790.85
TRUST FUND—PRINCIPAL ACCOUNT (See Foot Note):			
Cash—Due from Depository:			
Principal Cash	$ 44.11		
Income Cash	156.13	200.24	
Investments (At Cost):			
United States Treasury and Savings Bonds	7,837.00		
Stocks (Market Value $4,736.37)	4,939.69		
First Mortgage 4½% Real Estate Note	3,000.00	15,776.69	
Total Trust Fund Principal Account			15,976.93
			$ 21,421.91

NOTE: Trust Fund Account Figures were taken from Trust Agent's report, First and Merchants National Bank of Richmond, and were not verified in any manner.

VIRGINIA ACADEMY OF SCIENCE

RICHMOND, VIRGINIA

CONSOLIDATED FUND BALANCE SHEET

MARCH 31, 1950

(Prepared from Records without Audit or Verification)

EXHIBIT "A" (Continued)

LIABILITIES AND FUND SURPLUS

GENERAL FUND:			
Advance Payment on Dues		$ 2.00	
Fund Balance		2,993.52	
Total General Fund			$ 2,995.52
RESEARCH FUND:			
Fund Balance		658.61	
Total Research Fund			658.61
TRUST FUND—INCOME ACCOUNT:			
Fund Surplus:			
Balance—April 16, 1949		1,917.82	
Deduct:			
Income Transferred to Research Fund	$ 176.97		
Less Commission to Trust Agent	50.00	126.97	
Balance—March 31, 1950		1,790.85	
Total Trust Fund Income Account			1,790.85
TRUST FUND—PRINCIPAL ACCOUNT:			
Fund Surplus:			
Balance—April 16, 1949		$ 15,820.54	
Add:			
Gain on Sale of Stock Rights	$ .26		
Excess of Income over Distribution	156.13	156.39	
Balance—March 31, 1950		$ 15,976.93	
Total Trust Fund Principal Account			15,976.93
			$ 21,421.91

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA
GENERAL FUND
STATEMENT OF RECEIPTS AND DISBURSEMENTS
FOR THE PERIOD
APRIL 16, 1949 TO MARCH 31, 1950, INCLUSIVE

EXHIBIT "B"

BALANCE ON DEPOSIT—APRIL 16, 1949:			
First and Merchants National Bank of Richmond			$ 672.80
RECEIPTS:			
Revenue:			
Dues: Regular Members	$ 2,445.50		
Collegiate Members	119.00		
Contributing Members	340.00		
Sustaining Members	274.00	$ 3,178.50	
Gifts, Grants and Bequests:			
Undesignated	3,025.00		
Virginia Journal of Science	638.00		
James River Project	200.00		
		3,863.00	
Miscellaneous Revenues		79.65	
Total Revenues		$ 7,121.15	
Non-revenue:			
Advance Payment on Dues		2.00	
Reimbursement Payments Due from Other Funds		278.50	
Total Receipts			7,401.65
			$ 8,074.45
DISBURSEMENTS:			
A.A.A.S. Meeting Expense		$ 118.00	
Honorarium		300.00	
James River Project		108.85	
Junior Academy of Science		64.50	
Meeting Expenses:			
Dinners, Teas, Tours, etc.	$ 1,257.00		
Receipts from Dinner Tickets and Tours	1,065.49	191.51	
Miscellaneous Expense		184.94	
Postage and Express Charges		303.55	
Printing Expenses (Includes Proceedings)		1,225.74	
Science Talent Search		17.85	
Stationery Supplies and Stenographic Services		229.99	
Virginia Journal of Science:			
Pledges Received (Revenues)	638.00		
Grant From General Fund	1,652.00		
Expenditures	44.00	2,334.00	
Total Disbursements			5,078.93

BALANCE—MARCH 31, 1950 (Exhibit "A")		$ 2,995.52
Consisting of:		
Cash on Deposit First and Merchants National Bank of Richmond—Checking Account:		
General Fund	$ 2,796.69	
James River Project	174.68	
Virginia Science Talent Search	24.15	
Total		$ 2,995.52

RESEARCH FUND

STATEMENT OF RECEIPTS AND DISBURSEMENTS

FOR THE PERIOD

APRIL 16, 1949, TO MARCH 31, 1950, INCLUSIVE

EXHIBIT "C"

BALANCE—(*Deficit*)—April 16, 1949		$ 142.50
RECEIPTS:		
Revenues:		
Income from Trust Investments	$ 523.61	
Gifts, Grants and Bequests	459.00	
Total Revenue Receipts		982.61
		$ 840.11
DISBURSEMENTS:		
Grants-in-Aid Awards	50.00	
Miscellaneous Expense	131.50	
Total Disbursements		181.50
BALANCE—MARCH 31, 1950 (Exhibit "A")		$ 658.61
Consisting of:		
Cash on Deposit First & Merchants National Bank of Richmond—Checking Account		$ 658.61

TRUST FUND INVESTMENT INCOME CASH ACCOUNT

STATEMENT OF RECEIPTS AND DISBURSEMENTS

FOR THE PERIOD

APRIL 17, 1949, TO MARCH 31, 1950, INCLUSIVE

EXHIBIT "D"

RECEIPTS:		
Income—Dividends received from stocks held		$ 65.52
DISBURSEMENTS:		
Remittance to Virginia Academy of Science—Research Account	$ 16.38	
Transfer of Income to Principal Account	49.14	65.52
BALANCE—MARCH 31, 1950		None

TRUST FUND INVESTMENT PRINCIPAL CASH ACCOUNT
STATEMENT OF RECEIPTS AND DISBURSEMENTS
FOR THE PERIOD OF
APRIL 17, 1949, TO MARCH 31, 1950, INCLUSIVE
EXHIBIT "E"

BALANCE—APRIL 17, 1949			$ 176.97
RECEIPTS:			
Revenue:			
Dividends on Stocks held	$ 207.25		
Interest on Government Bonds	330.00	$ 537.25	
Non-revenue:			
Transfer of Income from Investment Income Account		47.14	
Total Receipts			586.39
			$ 763.36
DISBURSEMENTS:			
Remittances to Virginia Academy of Science—Research Fund		$ 557.23	
Trust Agent's Commission		50.00	
Total Disbursements			607.23
BALANCE—MARCH 31, 1950 (Exhibit "A")			$ 156.13

REPORT OF THE RESEARCH COMMITTEE

The Research Committee, during the past year, has acted favorably upon the following applications for research grants-in-aid:

1. Robert T. Brumfield, Longwood College—$150.00 for materials to continue his studies of "Cell Growth and Division in Living Root Meristems" which he published in the American Journal of Botany eight years ago.

2. Richard L. Hoffman—$50.00 to help defray the expenses of a zoological collecting trip into southwest Virginia during June of this year for the purpose of obtaining study material in various animal groups.

A far greater number of research papers than ever before have been submitted for the J. Shelton Horsley Research Award. Fifteen of them were considered for the prize. The winner of the Award and honorable mention will be announced at the Academy dinner.

H. RUPERT HANMER

REPORT OF THE FINANCE AND ENDOWMENT COMMITTEE

As the entire report of the financial statements is given, no detailed account will be made here, except for the following items which may warrant further explanation.

(a) James River Project Committee—$108.85. This item was carried on the Academy books as a record; the money belongs to the James River Project and the Academy books were used only as a depository.

(b) The miscellaneous expenses of $184.94 included $138.00 for the audit and $12.50 on the premium for bonding of the Treasurer, so actually there was only $34.44 miscellaneous expenses. Most of this remainder was used in the expenses of running the Sections, a detailed account of which will be found in the Treasurer's report.

The rest of the items are self-explanatory, and each was discussed by the Committee and found in order.

After careful study of the expenses for 1949-50, the Committee recommends the following budget for the year 1950-51:

	1949-50	*Proposed* 1950-51
A.A.A.S. Meeting	$ 118.00	$ 100.00
Honorarium	300.00	300.00
E. C. L. Miller Award	50.00	50.00
Junior Academy of Science	64.50	
		75.00
and Science Talent Search	17.85	

Meeting Expenses	191.51	100.00
Audit	138.00	145.00
Premium on Treasurer's bond	12.50	12.50
Stationery, supplies, and stenographic services	229.99	230.00
Postage and express charges	303.55	275.00
Miscellaneous	34.44	30.00
	$1460.34	$1317.50

The Committee feels that this is the minimum expense on which the Academy, exclusive of the Journal, can operate, and that other functions, such as the Science Talent Search and Junior Academy of Science, should be expanded wherever possible, and therefore in the future may need more money instead of less.

The total income from last year's dues was $3178.50, of which approximately $300.00 was for back dues, leaving $2878.50 from current dues. If $2.00 of the dues from each regular, contributing and sustaining member is turned into the Journal Fund, this would amount to $1789.00, provided the roster remains the same, and would leave only $1098.50, or a deficit of $219.00, if the proposed budget is followed. The membership of the Academy is increasing, and it is hoped that many of the regular members will change to contributing and sustaining membership; this, we believe, will increase the funds sufficiently to overcome the deficit.

With these explanatory remarks, the Finance and Endowment Committee recommends the following:

(1) That the budget as outlined for 1950-51 be adopted.

(2) a. That $2500.00 of the original gift of $3000.00 from Clinton M. Kilby, of Lynchburg, be used as a capital fund, the principal of which be maintained and as soon as possible built up to the $3000.00; and

b. That efforts be made to increase this capital fund, the income of which would be turned into the general fund to defray current expenses, and expenses of the Science Talent Search and the Junior Academy of Science.

(3) That $2.00 of the collected dues of each regular, contributing, and sustaining member be turned over to the Journal for the yearly subscription.

(4) That Foley F. Smith be commended on the manner in which he has conducted the affairs of the office of Secretary-Treasurer.

GUY W. HORSLEY

REPORT OF THE COMMITTEE OF THE JUNIOR ACADEMY OF SCIENCE

The first organized activity of the Committee was a meeting held at the Hotel John Marshall, Richmond, May 6, 1949, with eight members of the Committee present. A program for the Junior Academy of Science Committee was discussed and the Committee agreed: (1) To take the necessary action to provide scholarships for worthy science teachers, (2) To work with the State Superintendent of Schools to provide closer liason between the Department of Education and the high school teachers in the State of Virginia and to establish a means of recognizing outstanding science teachers, (3) To cooperate with the State Department of Education in establishing a suitable curriculum for graduate and undergraduate training of science teachers in the universities and colleges of Virginia, and (4) To establish and maintain more scholarships for worthy, outstanding science students in the high schools.

A roster was maintained of the Science Clubs in Virginia. Sponsors and members of Science Clubs were encouraged to participate in the activities of the Virginia Junior Academy of Science, including the Science Talent Search and the Science Open House Contests. The names of all Science Clubs registering in the Junior Academy of Science were forwarded to the Secretary of the Science Clubs of America, Miss P. M. Patterson, Washington, D. C., who kept the various Clubs informed of opportunities and activities of Science Clubs. Two mimeographed letters were sent to all active and inactive Science Clubs requesting: (a) An early enrollment in the Academy of Science, (b) Enrollment in the National Science Talent Search, (c) Preparation of scientific exhibits at the Science Open Houses, (d) Science teachers were requested to make use of the speakers on the scientific roster. In February and again in April a follow-up letter was sent to all Club Sponsors who indicated interest in the Junior Academy of Science. In November, the writer visited the State Superintendent of Education in Richmond and discussd with him the status of science instruction in the high schools of Virginia, requested closer liason between the Virginia State Department of Education and the science teachers, and requested that more adequate support be given to the science teaching and activities in Virginia. The Superintendent of Education resigned to accept another position; this Committee has awaited the appointment of a new Superintendent of Education to follow up these proposals.

B. N. Cooper, Co-Chairman of the Junior Academy of Science Committee, has made a special study of a curriculum for science teachers and made an informal report of his activities before the assembly of the Virginia Academy of Science at the Annual Meeting at Roanoke College, May 11, 1950.

Science Open Houses were held at:

Medical College of Virginia, Richmond, March 31, 1950, F . P. Pitts, Chairman
William and Mary College, Williamsburg, April 2, 1950, O. F. Schuette, Jr., Chairman
Bridgewater College, Bridgewater, March 31, 1950 Harry Jopson, Chairman
Virginia Polytechnic Institute, Blacksburg, April 22, 1950, in connection with the annual High School Day, P. C. Scherer, original Chairman, B. N. Cooper, substituting
University of Virginia, Charlottesville, April 1, 1950, Raymond C. Bice, Chairman
University of Richmond, Richmond, April 20, 1950, Sherman Grable, Chairman
Saint Pauls School, Lawrenceville, April 21, and 22, 1950, for negro students, J. H. Johnson, Chairman.

The total number of Science Clubs affiliated with the Academy of Science this year was 25, the complete membership has not been received.

The following Clubs submitted written summaries of activities and accomplishments during the season 1949-1950:

Spring Farm High School, Lexington, Miss Elizabeth Dunlap, Sponsor
Madison Heights High School, Mrs. Katie V. McDermott, Sponsor
Craddock High School, Portsmouth, C. W. Wilkinson, Co-Sponsor
Wilson Memorial High School, Fishersville, Mrs. B. G. Heatwole, Sponsor
Newport News High School, Newport News, Miss Susie V. Floyd, Sponsor
Radford High School, Radford, Miss Mae Jennings, Sponsor
Warren High School, Front Royal, Mrs. Ada Miller, Sponsor

The State Contests were held at Roanoke College, Salem, May 10-11. There were four club exhibits and eleven individual exhibits. The winners announced at the banquet were as follows:

Awards to Club Sponsors:

(a) E. C. L. Miller prize to J. L. Perry, Booker T. Washington High School, Norfolk
(b) University of Virginia Mountain Lake Biological Scholarship to F. D. Kizer, Norview High School, Norfolk
Alternate: L. W. Jarman, Thomas Jefferson High School, Richmond
(c) William and Mary Scholarship to Miss Susie V. Floyd, Newport News High School, Newport News
Alternate: Miss Mae Jennings, Radford High School, Radford

Club Exhibit Winners:

1st Chemistry Club, Wilson Memorial High School, Fishersville, Mrs. B. G. Heatwole, Sponsor

2nd Newport News Science Club, Newport News. Miss Susie V. Floyd, Sponsor

Individual Exhibit Winners:

1st Charles Moncure. Radford High School, Radford
2nd Pete Giesen, Radford High School, Radford
3rd Thomas Newby, Booker T. Washington High School, Norfolk
4th Betty Heuser, Radford High School, Radford
5th Faye Balance, Norview High School, Norfolk

Honorable Mention:

William Cleves, Booker T. Washington High School, Norfolk
Elaine Shear, Blacksburg High School, Blacksburg

The Committee Chairman contacted several colleges in Virginia relative to additional scholarships for science students and teachers. Several scholarships have been made available to science students. In one case the Committee was responsible for raising the amount of the scholarships. All colleges promised further consideration in providing additional funds for future scholarships for both science teachers and students.

The Committee of the Junior Academy of Science will continue to stress greater activities in the Junior Academy of Science program, better teaching of science, more opportunities for scholarships and awards for science students and science teachers, and more adequate curricula for training science teachers in Virginia.

If possible, arrangements will be made through the Secretary of the Science Clubs of America for information circulars to go directly to the Science Club Sponsors as a means of expediting the distribution of pertinent information.

The Committee acknowledges the splendid cooperation of all who contributed to the program during the past year.

FLOOD S. ANDREWS

REPORT OF THE COMMITTEE ON SPEAKERS BUREAU

The Speaker's Bureau is in its second year, apparently in a position now to render better service to High School Science Clubs and Junior Academy members than during its first year. There have been no requests from speakers, industrial and collegiate, to drop their names from the "Roster of Scientific Speakers" other than for reasons of change of resident to out of state; several new names have been added. A new feature has had its initiation this year—the practice of taking a Science Club or a High School Science class to a nearby college for a demonstration talk in the classroom. This permits the use of physical and visible education equipment not available on high school visits. Science teachers in the colleges can expect more requests from high school science for classroom visitation. Industrial scientists in the Speaker's Bureau may be getting requests for some Science Club or class visits for guided tours

in the plant followed by some lecture demonstrations instead of asking for industrial speakers making trips to the high schools. Industrial scientists have found it rather difficult to get away from work during the daytime when the high school classes and the club meetings are held.

The information to the high school Science Clubs and science classes was again accomplished through the medium of the Virginia High School League. Many contacts by letter and phone were received by the committee for speakers, but the major number of contacts were made directly by the Science Club officers or club sponsor directly with a speaker selected by the high school group. There are 72 speakers representing the collegiate membership, while the speakers on the roster from industrial organizations number 44.

From the very small high school groups, science classes or Science Clubs, come the major number of requests and these groups make the most use of the Speaker's Bureau. To these groups, such visitations are real occasions and the speaker finds that he has to make his talk before the entire high school student body and faculty. The speaker has a real talk and has to present his best. Unfortunately, the larger city schools seem to be overcrowded with club and other activities so that requests for speakers from such groups are practically nil. It is the small town or country schools who request the service and who are gaining this advantage over their big city high school brothers and sisters to meet, to hear, and to benefit from the contacts with capable and well known scientists from the colleges and industry in Virginia. The committee wishes that the feeling could be dispelled that only one request for a speaker per year will be honored, a feeling held by many of the small schools. The sponsors also can help the Speaker's Bureau by remembering that the groups are not limited to just one speaker per year. There are many very good scientific speakers who want to meet the young men and girls of Virginia High Schools who are interested in science.

The committee will consist of three members this coming year in order to facilitate contacts. This means that the high schools will have a representative of the Senior Virginia Academy of Science close at hand to help them obtain speakers for the classes and their clubs.

FRANK C. VILBRANDT

REPORT OF THE
FIFTH VIRGINIA SCIENCE TALENT SEARCH

In the Fifth Virginia Science Talent Search 445 seniors requested Aptitude Examinations from Science Service. Of the total examinations requested, 96 entries completed all requirements for competition and of these 6 were chosen as "Honorable Mention" in the National Search as follows:

Betty C. Cook	Wilson Memorial High School	Fishersville
Anna L. Davis	Wilson Memorial High School	Fishersville
John W. Layman	Blacksburg High School	Blacksburg
Claire J. Millhiser	Thomas Jefferson High School	Richmond
Camden B. Pierce	Thomas Jefferson High School	Richmond
Carroll E. Smith	Huntington High School	Newport News

The 96 complete entries were studied by the Committee and, based upon consideration of the Aptitude Examination score, the Essay, the high school record, teacher recommendation, and interviews at the Science Open Houses, forty five were chosen as Finalists in the State Search. These 45 were further screened by panels of judges at the Annual Meeting of the Junior Academy held May 11, 1950 at Roanoke College and fifteen were chosen as State Winners and 30 as State Honorable Mention as listed below.

STATE WINNERS

Name	*High School*	*City*
J. W. Layman	Blacksburg High School	Blacksburg
C. B. Pierce	Thomas Jefferson High School	Richmond
C. E. Smith	Huntington High School	Newport News
Betty C. Cook	Wilson Memorial High School	Fishersville
Claire J. Millhiser	Thomas Jefferson High School	Richmond
Anna L. Davis	Wilson Memorial High School	Fishersville
A. R. Giesen	Radford High School	Radford
C. S. Hynes	Thomas Jefferson High School	Richmond
N. W. Patrick	Hampton High School	Hampton
D. B. Propert	Thomas Jefferson High School	Richmond
H. Rolston	Thomas Jefferson High School	Richmond
J. S. Hale	Robert E. Lee High School	Staunton
R. F. Scott	Radford High School	Radford
J. Conn, Jr.	Newport News High School	Newport News
H. Davis	Thomas Jefferson High School	Richmond

STATE HONORABLE MENTION

Name	*High School*	*City*
Mary E. Armstrong	Lane High School	Charlottesville
E. R. Bare	Lexington High School	Lexington
S. K. Beal	Thomas Jefferson High School	Richmond
W. H. Beal	Thomas Jefferson High School	Richmond
Mary L. Beverly	Jefferson High School	Roanoke
F. S. Biesecker	Thomas Jefferson High School	Richmond
B. O. Cole	Radford High School	Radford
E. D. Collins	Thomas Jefferson High School	Richmond
L. T. Crowder	Kenbridge High School	Kenbridge
E. S. Dolen	Thomas Jefferson High School	Richmond
G. A. Ezekiel	Thomas Jefferson High School	Richmond
D. B. Flanagan	John Marshall High School	Richmond
Elizabeth M. Heuser	Radford High School	Radford
R. J. Holland	Ridgeway High School	Ridgeway
G. J. Hopkins	Episcopal High School	Troutville
J. King	Jefferson High School	Roanoke
H. W. Lewis, Jr.	Lexington High School	Lexington
G. Link	Thomas Jefferson High School	Richmond
A. S. Mattox	Robert E. Lee High School	Staunton
D. A. Pohlig	Thomas Jefferson High School	Richmond
H. L. Price	Blacksburg High School	Blacksburg
G. B. Rutherford	John Marshall High School	Richmond
T. H. Sanford	Hargrave High School	Wake Forest, N.C
J. T. Smith	Robert E. Lee High School	Staunton

Marilyn J. Thompson	Newport News High School	Hampton
Dorothy L. Wachter	Thomas Jefferson High School	Richmond
R. A. Wahrman	Norview High School	Norfolk
M. L. Weger	Newport News High School	Newport News
Harold White	Thomas Jefferson High School	Richmond
W. W. Young	Jefferson High School	Roanoke

The Committee feels that considerable success was attained in the Search and that the interest therein shown by the participants is an encouraging sign for the future. It wishes to express its appreciation to all whose aid made its work possible and especially to those colleges whose generous offers of scholarships make it certain that no one of the finalists will have to forego a college education for lack of funds.

May this committee point out that the financial demands for correspondence, committee meetings, and other details have grown to a point where it is unreasonable to expect an individual, or an individual institution to meet them. The functioning of the committee in this search would have been virtually impossible were it not for the aid given by the Virginia High School League through its Executive Secretary, Richard R. Fletcher. The Committee under present conditions is simply not able to function satisfactorily on one meeting a year, and no progress can be made in this direction unless reasonable financial assistance is given to it.

PHILIP C. SCHERER

REPORT OF THE COMMITTEE ON THE EXCHANGE OF FOREIGN STUDENTS

There are two or three organizations which may compile the statistics of the foreign student population in the institutions of higher learning in the United States. The statistics used in this report are taken from the 1950 publication, "The Unofficial Ambassadors," which has been issued for many years by the Committee on Friendly Relations Among Foreign Students, one of the most important organizations in this country engaged in work for and among students from other countries. The number of these students—"Unofficial Ambassadors"—now studying in our colleges and universities is 26,000. The University of California has the largest number of foreign students, 1530, but they are in five separate centers of the University in different parts of the State. Columbia University in the City of New York has the largest number of students from abroad, 1224, who are studying in the same city.

Of the 45 institutions of higher learning in the State of Virginia, 31 have one or more foreign students this academic year. The total number of students from other countries in the Virginia colleges and universities is 197, or an increase of 20 over the academic year 1948-49. Of this number, 117 are men and 80 are women. The Virginia institutions that have five or more foreign students are as follows:

Virginia Polytechnic Institute	38
University of Virginia	23
Eastern Mennonite College	23
Hampton Institute	15
Blackstone College	13
University of Richmond	10
Virginia Union University	10
Ferrum Junior College	5
Washington and Lee University	5

In other words, 9 of the institutions have 142 students from abroad, 22 have 55, and 14 have none.

The 197 foreign students came from 47 different countries or political entities. From Africa there are 22, from Asia, 37, from Europe 35, from Latin American Republics 71, from Canada and the British West Indies 32. The countries that sent 12 or more of these students to Virginia are:

Canada	29	Germany	13
China	28	Venezuela	12
Cuba	22		

The chief fields of study of these students from abroad in our Virginia colleges and universities are of interest and significance. The major areas of their academic interest are as follows:

Engineering	29	Liberal Arts	11	Home Economics	8
Business	19	Biology	9	Eng. Literature	6
Bible	17	Chemistry	9	Agriculture	6
Business Administration	11	English	8	Law	5
				Mathematics	5

The figure of 197 for Virginia is of interest in comparison with the foreign student population in other states in the South in the academic year, 1949-50:

Alabama	130	Mississippi	75
Arkansas	59	North Carolina	298
Florida	274	South Carolina	87
Georgia	260	Tennessee	240
Kentucky	181	Texas	698
Louisiana	555	Virginia	197

Of the 26,000 students from other countries now in our colleges and universities, 3054 are in the twelve states of the South given above. This is an increase of exactly 200 over the academic year 1948-49.

There are additional statistics in this important area for the development of that deep cultural and spiritual understanding so essential in our ideologically divided world of today. It would not be difficult to assemble the statistics given a modest budget for this purpose. They would undoubtedly point the day to an increasingly valuable participa-

tion on the part of our Virginia institutions in the expanding foreign student program. To interest private organizations in furnishing funds or hospitality to enable students from abroad to come to Virginia for study would increase the number of students appreciably above the present 197. College fraternity and sorority chapters, for example, in large numbers are furnishing hospitality to students from abroad, and the institutions waive tuition. It might be of great assistance if the Virginia Academy of Science took the initiative in securing the cooperation of other academic societies in this state in the work for foreign students. A concluding observation is that of even greater importance than increasing the number of students from other lands on our campuses, our college and university authorities should make certain that these alert and eager young students from abroad should be helpfully oriented and made to feel at home in our academic communities.

EDGAR J. FISHER

REPORT OF THE MEMBERSHIP COMMITTEE

The Committee is happy to report that, due to the combined efforts of the Committee members, and particularly to the energy and efforts put forth by President Harshbarger, the membership shows an excellent net increase. However, we hope that the entire Academy membership, now that the Virginia Journal of Science is established, and the Monograph of the Academy published, will use these excellent examples of the workings of the Academy to secure still more members.

For the past year from April 1, 1949 to April 1, 1950, the Academy has gained 248 members under the following classifications:

Collegiate Members	79
Regular Members	165
Contributing Members	3
Sustaining Members	1
TOTAL	248

During the year the Academy has lost 8 members by death. The names of these members are contained in the report of the Resolutions Committee. The decrease in the number of member dropped over the turnover of last year was marked, and the Committee is happy to say that the entire membership is in good standing with the exception of less than 100 members who are only one year in arrears.

The recapitulation of the total membership is as follows:

Members last year	1042
Members lost:	
Classified as follows:	

Collegiate Members	56
Regular Members	17
Contributing Members	4
Sustaining Members	1
Deceased	8
TOTAL	86
New Members in 1949-50	248
Present Membership of the Academy April 1, 1950	1204
Net Gain over 1949-50	162

The Chairman wishes to express his appreciation and thanks to all of the members of the Committee. FOLEY F. SMITH

REPORT OF THE RESOURCE-USE EDUCATION COMMITTEE

In general, the resource-use education activities presented in the reports of the last two years have been continued or expanded. Likewise, the problems previously emphasized continue to persist.

In addition to its long-established undergraduate instruction in various fields of conservation and resource management, the Virginia Polytechnic Institute offers graduate training in wildlife management, soils, geology, and other fields. Both staff members and graduate students in the Wildlife Section of the Virginia Polytechnic Institute Biology Department have appeared frequently at schools and at public meetings to present illustrated lectures on conservation principles and to discuss conservation problems. Monthly radio talks have been given on the Virginia Polytechnic Institute program on such subjects as soil management, forestry and water conservation.

Cooperating with the Virginia Polytechnic Institute have been numerous state and federal agencies. Other educational institutions have also cooperated largely in bringing about a better public appreciation of the importance of proper resource management. The Marine Fisheries Laboratory of the College of William and Mary, for example, is not only doing excellent work in training students from a number of colleges but also furnishes information and advice that is becoming more and more appreciated by agencies and individuals concerned with marine resources. The State Department of Education has made effective films available to public schools, and has presented and encouraged the use of conservation materials in the classroom. Leadership on conservation projects is frequently provided to clubs and other groups by teachers and students. Perhaps most encouraging of all is the growing recognition by various clubs and associations that these teachers and students can provide them such help.

An outstanding example of this type of recognition is provided by the Virginia Division of the Izaak Walton League of America. This organization, cooperating with the Virginia Commission of Game and

Inland Fisheries, donated $500 to provide prizes for the 1950 Conservation Essay Contest carried on in the State's public schools. The League also donated $100 as a research prize for the best work done at a Virginia college during 1950, related to the conservation and management of wildlife resources.

Other organizations which have done and are doing excellent work in resource-use education include the Virginia Federation of Garden Clubs and the Virginia Federation of Women's Clubs. Both of these organizations operate summer conservation camps which have been outstandingly successful for the past several years.

That Virginians have learned more about resource-use is indicated by the widespread acceptance and approval of the Virginia Water Control Act.

Our need is for a much more extensive program of resource-use education. Every educational institution and every school must contribute to it until finally all citizens groups and all our individual citizens achieve complete understanding.

At its meeting the Committee submitted the following two recommendations:

1. Whereas there is a legally constituted Advisory Council on the Virginia Economy which is responsible for the work of a number of sub-research committees dealing with several of Virginia's natural resources; the Resource-Use Education Committee recommends that the Virginia Academy of Science urge that the findings of these be compiled in volumes for use in Virginia's public schools and institutions of higher learning.

2. If the preceding recommendation is deemed inexpedient or inadvisable, the Resourse-Use Education Committee recommends that the Virginia Academy of Science urge the enactment of legislation creating a Resource-Use Education Commission which would be composed of representatives of all agencies concerned. An employee of the State Board of Education should serve as the Executive Secretary of this Commission.

ALFRED L. WINGO

REPORT OF COMMITTEE ON VIRGINIA FLORA

Activities in the study of the flora of Virginia has been that of individuals. R. S. Freer of Lynchburg College has published a major paper on his studies in the Blue Ridge Mountains. The thirty-seven page paper "A Preliminary Checklist of the Plants of the Central Virginia Blue Ridge" appeared in the March issue of *Castanea*. This is a welcome contribution leading towards our goal of a State-wide publication on the plant life of the State. The March issue of *Castanea* is devoted entirely to "Papers on the Botany of Virginia" and contains five papers, Mr. Freer's paper being the major one. Other papers in this issue are: H. H. Iltis, "Studies in Virginia Plants I". This is an annotated list

of "Bryophytes from the Vicinity of Fredericksburg"; H. A. Allard, "*Impatiens pallida f. speciosa* in the Bull Run Mountains"; Horace Truesdell, "Ferns in Clarke and Loudoun Counties"; and R. L. Hoffman, "Records of Picea in Virginia." The cost of the excess pagination, especially in Mr. Freer's paper, is partially supported from the funds of the committee. These funds have come from the sale of the "Flora of Richmond and Vicinity" and are earmarked for assisting in publications dealing with the flora of the State. Paul M. Patterson has published two major papers on the Bryophytes of the State.

Field work has been actively conducted by Miss Lena Artz in the Massanutten Mountains. Her report on "Some Notes on Virginia Plants not previously reported from Massanutten Mountains Area" appears in the April issue of the Virginia Journal of Science. Hiden T. Cox is giving special attention to the Ericaceae of the State. A. B. Massey and graduate students are working on the vegetation in different parts of the State. In this connection C. P. Gilchrist has been studying the vegetation in the larger marshes of the Coastal Plain, J. W. Engle, Jr., the woody vegetation in different parts of the State in relation to the white tail deer population. Work in the development of the herbarium at Virginia Polytchnic Institution continues. So all in all, progress seems to have been made, and the future looks hopeful.

Cash on hand at last report	$ 93.48
Receipts since May, 1949	23.60
Cash on hand May 15, 1950	117.08
Savings account	148.76
Total funds	$265.84

A. B. MASSEY

REPORT OF THE COMMITTEE ON VIRGINIA FAUNA

The year 1949 has seen slow but marked progress in our knowledge of the Virginia Fauna. Perhaps one of the more significant steps forward has been made by the staff of the Virginia Fisheries Laboratory in setting up a systematic file on the marine and brackish water fauna of the State. Concurrently the file on the freshwater and terrestrial fauna is continuing to expand.

Among the several publications related to the Virginia fauna during the year those of greater general interest are R. L. Hoffman's Turtles of Virginia, R. S. Bailey's manual on the Blue Crab, Paul R. Burch's Molluscan studies and E. C. Raney's Fishes of the James Riven Basin. In addition two works of considerable importance have been completed (although not yet published): Austin H. Clark's Butterflies of Virginia and M. L. Bobb's studies on the aquatic and semiaquatic hemiptera of Virginia.

Progress reports made by those individuals actively engaged in faunistic studies indicate that collections of the following groups have

grown considerably during the past 12 months: Mollusca, Branchiobdellidae, Crustacea, Diplopoda, Collembola, Ephemeridae, Hemiptera, Arachnida, Pisces, Amphibia and Reptilia.

With the resumption of the publication of the Virginia Journal of Science it was deemed advisable by the Committee to delay publication of a guide to the snakes of Virginia in the form proposed in our 1949 report, and it is anticipated that this guide will be submitted to the Journal for publication early next year.

The educational activities of the Fauna Committee have been carried on largely by John Thornton Wood of the Virginia Fisheries Laboratory who has spent considerable time working with high school students in eastern Virginia promoting interest in faunistic studies. In March and April an eight-week course on the local herpetofauna was given for the Explorer Scouts of the Lower York-James Peninsula.

The Committee feels that the resumption of the publication of the Virginia Journal of Science has established an important mile post along its lines of endeavor, and looks forward to the important role that it will assume in providing a medium through which local faunistic studies may be made available to the public at large. We would like to take this opportunity to congratulate Mr. Ladley Husted and his committee for doing such an excellent job in making this long-hoped-for event a reality.

HORTON H. HOBBS, JR.

REPORT OF THE VIRGINIA JOURNAL OF SCIENCE

It is with pleasure that the Editorial Staff of the Virginia Journal reports to the Academy that two numbers of the Journal have been published since it was voted by the membership at the last Annual Meeting that it be reinstated.

To date we have received a total of 20 manuscripts of which 10 have been published, five rejected, and five remain to appear in one of the later numbers. Thus we are gradually building up a backlog of papers which will enable us to distribute the papers in each number over a wider field.

The staff has presented with pride the lead articles in numbers one and two of the current volume, and wishes to take this opportunity to express its appreciation to Professors Harold L. Alden and G. T. Whyburn for making these contributions toward the success of the Journal.

While a great many details are still to be worked out, the Staff has followed the suggestions of Mr. Husted and his committee, and has succeeded in working out a smoothly running procedure. It seems desirable that the membership be acquainted with certain established policies concerning the handling of manuscripts. All manuscripts submitted to the Technical Editor are forwarded to the appropriate Section Editor who in turn sumbits them to three referees whose names are not revealed. These referees submit to the Section Editor their criticisms and recom-

mendations, and the latter then returns the manuscripts to the Technical Editor with a summary of the criticisms and instructions as to what disposition should be made of them; i.e., whether they are suitable for publication, or whether they should be revised, shortened, etc. Following such a procedure, although admittedly clumsy, assures the Journal of papers of better quality.

The editorial policies are summarized on the back inside cover of each number of the Journal, and are omitted in this report.

The Graphic Arts Department of the Radford News Journal was awarded a contract for printing the 1950 volume of the Journal at a cost of $3.50 per page for 1500 copies per issue for four issues. Mr. Will D. Baugh, Manager of the Graphic Arts Department, has cooperated in every way possible to make the Journal a publication in which both the Academy and his staff can take pride, and the editors of the Journal are deeply grateful for his interest and cooperation.

The Alderman Library of the University of Virginia has been assigned exclusive exchange rights for the Journal, for which the Journal receives an annual remuneration of $300.00.

Number two of the current volume carries the first of a series of advertisements from which the Journal will realize a substantial return.

Early last summer the members of the Academy were canvassed in order to determine to what extent the membership was interested in receiving the Journal, and those interested were asked to contribute a sum of $2.00 to aid in getting the publication under way. It was gratifying to the Journal Staff to know that the membership was behind this project to the extent that $782.00 were contributed. With this demonstration of interest it appeared certain that the Journal could not fail. At the Council Meeting of November 4, 1949, it was voted that in addition to the above mentioned contributions, $2.00 from the dues of all classes of membership, except that of Collegiate, be turned over to the Journal with the understanding that surplus funds be returned to the general fund when a suitable backlog has accumulated.

The Editorial Staff feels that this report would be incomplete should it fail to inform the membership as to the contributions made to the Academy by the Journal. These are enumerated below.

1. It publishes the Proceedings of the Academy.
2. It carries the news to the membership which eliminates at least two or three letters which would involve additional stenographic costs as well as postage.
3. It keeps a current mailing list for the Academy.
4. It sends the Journal to all members of the Academy. This not only aids in securing additional members but also stimulates many members to continue their membership who might otherwise fail to do so.
5. It furnishes addressograph service to the Academy, and makes all new plates for the Academy membership.

6. It encourages research by furnishing a medium of publication for papers by the membership.
7. It prepares and prints the Program of the Annual Meeting, and distributes it to the membership.
8. It provides a depository in cooperation with the Library of the Virginia Polytechnic Institute for publications of the Academy.
9. It lends dignity to the Academy as well as prominence among the learned societies.
10. There are considerable savings made to the Academy by reducing the stenographic charges of the secretary's office, by providing mailing and addressograph services at greatly reduced costs, and in eliminating the cost of sending individual announcements to the membership. Reduced mailing rates are made possible by using second class mailing privileges through the publication of the Journal. In addition it was possible to accomplish savings by obtaining printing rates for the entire publication.

A financial statement of the Journal is appended to this report.

HORTON H. HOBBS, JR.

VIRGINIA POLYTECHNIC INSTITUTE
STUDENT ACTIVITIES OFFICE AUDIT REPORT FOR
VIRGINIA JOURNAL OF SCIENCE
From August 27, 1949 to April 4, 1950

RECEIPTS:		
Donations	$ 782.00	
Gifts	10.00	
Contributing Members	2.00	
Academy Subsidy	1,642.00	
Charge for extra pages	15.17	
Alderman Library	150.00	
Advertising	35.00	
Subscriptions	6.50	
Miscellaneous	4.00	
TOTAL OF ALL RECEIPTS	$2,646.67	$2,646.67
EXPENDITURES:		
Reprints	$ 14.50	
Printing of Journal	339.30	
Postage	30.28	
Office Supplies	95.76	
Miscellaneous	.50	
Correction entry	4.00	
TOTAL OF ALL EXPENDITURES	$ 484.34	$ 484.34
NET AMOUNT		$2,162.33
STATEMENT OF CASH ACCOUNT		
Balance of cash at beginning of year	.00	
Add: Total receipts for Year	2,646.67	
Total of cash on hand during the Year	2,646.67	
Deduct: Total expenditures for Year	484.34	
Balance of cash at end of Year	2,162.33	
Balance		$2,162.33

AUDITED by Joe W. Guthridge, April 5, 1950

REPORT OF THE COMMITTEE ON PLACE OF MEETING FOR 1951

Three invitations have been received by the Committee offering facilities to the Academy for its 1951 meeting. The first to be received was that from Mr. Orville W. Wake, President of Lynchburg College; the second, from Miss Gillie A. Larew, Dean of Randolph-Macon Woman's College; and the third, from Mr. Robert W. Waller, Assistant Manager of The Jefferson Hotel, Richmond.

It is recommended that the Virginia Academy of Science hold its Twenty-ninth Annual Meeting on May 10, 11, and 12 at Lynchburg College.

It is further recommended that the secretary be instructed to write letters of appreciation to those from whom invitations were received, and to advise them of the action of the Academy as to where the Twenty-ninth Annual Meeting will be held.

HORTON H. HOBBS, JR.

REPORT OF THE LOCAL ARRANGEMENTS COMMITTEE FOR THE ROANOKE MEETING

The Committee on Local Arrangements was chosen largely from Roanoke and Hollins colleges, the sponsoring institutions, with Ashley Robey of Roanoke College acting as co-chairman. The Norfolk & Western Railroad and The American Viscose Corporation were also represented on this Committee. To the host institutions, to each member of this Committee, to others that volunteered to help us in various capacities, and to the Hotel Roanoke staff concerned, I take this opportunity to express my heartiest thanks for work responsibly and carefully executed.

The facilities of Roanoke College were given to the Science Exhibit Contest, the Science Talent Search, and the Junior Academy meetings as well as the Senior Academy business meeting on May 11th. Roanoke College provided housing facilities for most of the high school boys and girls on Wednesday and Thursday nights, as well as providing them with their annual Dinner. One hundred and eight junior members registered.

Arrangements were made for all 12 sections of the Academy to meet concurrently on May 12. This necessitated the utilization of a room in the N. & W. R. R. office building in addition to the facilities at Hotel Roanoke. Only four sections required space and equipment on May 13th. Six hundred seventy-four registered for these meetings.

A luncheon was arranged at Hotel Roanoke for the Collegiate Members on May 12th with 90 in attendance, and the Annual Dinner that evening with 138 in attendance. A reception was given by Hollins

College the afternoon of May 12 and was attended by about 200 members.

The following exhibits were set up in Hotel Roanoke: *Commercial*—American Viscose Corp., The Blakiston Co., Cardinal Products Co., Carolina Biological Supply Co., Phipps & Bird, Inc., and J. M. Stackhouse Co.; *Educational*—The Dairy Council of Roanoke; The National Park Service; The U. S. Food & Drug Administration, Federal Security Association; The Norfolk & Western Railroad; The U. S. Department of Agriculture, Forest Service; and the Virginia Fisheries Laboratory.

The meetings proved to be financially self-supporting as local income somewhat exceeded the local expenses incurred. A financial statement was sent to the Secretary-Treasurer and the balance accrued to the Academy budget.

We wish to thank all Academy members for their courtesy and fine cooperation.

P. M. PATTERSON

REPORT OF

THE VIRGINIA INSTITUTE FOR SCIENTIFIC RESEARCH

We are happy to report definite progress during the past year. What was once a dream of a research institute sponsored by the Virginia Academy is now a modest reality. On June 1, 1949, after a protracted controversy between the State of Virginia and a branch of the United Daughters of the Confederacy, the Research Institute opened its headquarters in the old Museum Building in the R. E. Lee Memorial Park on the Boulevard in the City of Richmond. Our special thanks are due to Governor William M. Tuck and Senator William A. Wright, Chairman of the Conservation Commission, for making this fine building available to the Research Institute. The first regular employees of the Institute were Henry Leidheiser, Jr. and Virgil E. Straughan, and they were soon joined for summer work by Edward Frost of the Thomas Jefferson High School. Three months were spent in cleaning and painting the main building and in sorting and distributing Confederate equipment which had been stored in the shop building to the rear. Laboratory work benches for the first floor of the main building and essential laboratory apparatus were purchased. Some furniture was bought and some was given by Mr. and Mrs. Robert M. Jeffress. A photographic dark room was constructed on the second floor.

On September 1st Clayton Roth joined the laboratory, and the first research project was begun. This consisted of a study of the mechanism of bright nickel plating for the Harshaw Chemical Company of Cleveland, Ohio. At the present time this project is continuing and four small projects for agencies such as the N.A.C.A. Laboratories at Langley Field and the University of Virginia have been carried out. During the year about $4,000 in unsolicited gifts have been received, and recently one of

our Trustees has offered to donate $18,000 for the purchase of an electron microscope if an equivalent amount for equipment can be raised elsewhere. The General Assembly renewed its appropriation for $10,000 a year for the biennium 1950-52, and it is planned to use this sum primarily for administrative purposes. At the present time a request is being made of a national foundation for a grant, and plans are being drawn up for other research projects. The firm of T. Coleman Andrews, with the generous assistance of Mr. Andrews and Mr. Paine, has installed a system of accounting. Our Secretary and Treasurer, Robert H. Kean, of the Virginia-Carolina Chemical Company, is at the present time voluntarily keeping the accounts of the Institute, and we are greatly indebted to him for this very important service. The Institute is also indebted again to Senator Lloyd Bird for advice and valuable assistance and to Governor-elect John S. Battle for support in obtaining the appropriation from the General Assembly.

At a meeting of the Board of Trustees in January it was agreed to offer to the Virginia Academy a room on the third floor of the laboratory building for use as an office or repository for Academy records. Granville Valentine, of Richmond, and Harry Byrd, Jr., of Winchester, were elected to the Board of Trustees. The next important step is the selection of a permanent Director of Research. At the present time it is proposed that the Institute specialize in the field of surface chemistry, including corrosion, electroplating, and catalysis, and in the near future in the uses of the ultracentrifuge, especially the determination of molecular weights, and in uses of the electron microscope.

The Research Institute now has a modest staff of six paid employees. They are: three full-time research workers, Henry Leidheiser, Virgil Straughan, and Clayton Roth; and three part-time assistants, Francis Denise who serves as a laboratory helper, Fred Hayes an instrument maker, and Margaret McElroy, a secretary.

The president of the Research Institute wishes to express his gratitude for the enthusiastic cooperation of the Board of Trustees, for the fine work of the Institute staff during the past year, and for the assistance of many members of the Virginia Academy. The continued sympathetic cooperation in the interesting and difficult problems ahead are requested of the members of the Academy.

ALLAN T. GWATHMEY

The following separate reports were given by Joe Guthridge and by the Resolutions Committee on Collegiate Activities and Collegiate Chapters.

REPORT OF THE COMMITTEE ON ACTIVITIES FOR COLLEGIATE MEMBERS*

The Committee is celebrating its first birthday this year and as is generally true with first year adventures, no outstanding achievements

*EDITOR'S NOTE.—In the revised constitution, adopted May 11, 1950 (see below), "Student Members" has been substituted for "Collegiate Members."

can be noted. The Committee began its activities in Richmond last year with a meeting of all Collegiate members attending the Academy, at which time there was a discussion of the nature of future meetings of the Collegiate group. There was a general consensus that there be no special sessions of the Collegiate members for presentation of papers, etc., but that a luncheon meeting would be desirable and should be held if possible.

Accordingly, a luncheon for the Collegiate group will be held on Friday, May 12, 1950 at the Hotel Roanoke. At this luncheon, the general officers for the newly organized Collegiate Chapter division of the Virginia Academy of Science will be elected.

There have been petitions from two college student groups for recognition as official Collegiate Chapters of the Virginia Academy of Science. The first was submitted by the students at the Virginia Military Institute, and the second by the students at the Virginia Polytechnic Institute. The officers of the petitioning chapter at Virginia Military Institute have been designated by President Harshbarger as acting officers of the Collegiate division until an election could be held at the meeting this Friday. The petitions of the two college groups mentioned above were approved at the meeting of the Executive Committee on Thursday afternoon, May 11, 1950.

We hope that with the impetus given the formation of Collegiate chapters this past year by the students at Virginia Military Institute, we will be able to report more progress and an enlarged collegiate section of the Academy at the meeting next year.

The Committee hopes that all members of the Academy who have suggestions for this Committee and its activities will feel free to express them.

JOE M. GUTHRIDGE

REPORT OF THE RESOLUTIONS COMMITTEE

The establishment of Collegiate Chapters of the Academy is in close agreement with our objectives of encouraging scientific ability and promoting research; therefore, the Academy should actively encourage and promote the formation of such Chapters and aid the Chapters in developing programs to stimulate interest in science. In doing this, the Academy must recognize the dangers inherent in forming such groups in colleges that are already overorganized, and must make continued effort to prevent the lessening of student interest that may lead to weakened or inactive Chapters. The following specific recommendations are made by the Committee:

1. At the present time the Academy should recognize Chapters only where the initiative for forming such a Chapter comes from the students, and where a group having interests in science has already been formed. The Academy should not attempt to establish Chapters where

no such group exists until after at least two years experience with Collegiate Chapters.

2. The Academy should recognize Chapters only where ten or more students are to be active members of the Chapter, and where one faculty member who is a member of the Academy agrees to act as advisor to the Chapter.

3. Members of the Chapters should be encouraged to become Collegiate Members of the Academy.

4. The President of the Academy shall appoint a Committee to supervise the activities of the Chapters. This Committee shall investigate the activities of the present Chapters and shall ascertain, as far as possible, the plans of other State Academies and the American Association for the Advancement of Science regarding the formation of such Chapters. The Committee shall then establish criteria to be used in the recognition of additional Chapters, and shall establish standards to be met by the present Chapters for continued recognition. It is recommended that the membership of this Committee be drawn from members at institutions where chapters are established; thus the report of the Committee can be based on first hand experience.

5. The Speakers Bureau of the Academy shall place their facilities at the disposal of the Chapters. A list of available speakers shall be furnished to each Chapter, and the Speakers Bureau shall act as an agency to arrange for speakers to visit the Chapters at times mutually convenient. All expenses of travel and lodging for a speaker shall be paid by the Chapter visited.

6. It is important that all work necessary for the operation of a Chapter be done by the student members, and that the faculty advisor serve in an advisory capacity only.

7. The Chapters should be warned against overspecialization. Each Chapter should make an effort to maintain a membership representing several fields of science and to arrange a yearly program in which no one field of science is overemphasized at the expense of others.

8. The Academy shall encourage all Chapter members and other Collegiate members to present papers at the annual meeting. These may be reports of student research, special problems and methods investigated by individual members or by the Chapter as a group, or other work such as the Honors work now done by students at many of our colleges and universities.

9. All members of the Collegiate Chapters shall be urged to attend the annual meeting. A luncheon meeting or other special meeting shall be arranged for them if possible, so that they may benefit by the mutual exchange of ideas.

The recommendations listed above will necessarily require revision after we have had more experience with Chapters and their actual func-

tions. We have our choice of either doing nothing and recognizing no Chapters of the Academy, or actively and strongly supporting these Chapters to make them as effective as possible. No intermediate course can meet with success. Since we have already recognized several Chapters we have made our choice. Having done so, we must do everything possible to make these Chapters effective in encouraging scientific ability and promoting research.

J. GORDON STIPE, JR.

The long awaited Academy publication, "The James River Basin—Past, Present and Future," was available at the meeting through the courtesy of Richard MacDonnell of Washington and Lee University, who personally brought the advance copies from Baltimore in time for the meeting. The first copy was presented to Justus Cline, to whom, with Wortley F. Rudd, the volume was dedicated. The report of the James River Project Committee follows.

REPORT OF THE JAMES RIVER PROJECT COMMITTEE

The last sentence of the 1949 annual report of the committee read, "It is hoped that the next annual report of the Chairman of the James River Project Committee will include a statement to the effect that the Monograph on *The James River Basin—Past, Present and Future* has been published."

It is a distinct gratification to announce that the Monograph has been published.

A limited number of copies are for sale at these meetings; others will be available as soon as received from the Albrecht Co. of Baltimore, which has been especially cooperative in binding a few copies in record time.

It is significant to note the following item in House Bill No. 31 as passed by the General Assembly of Virginia on March 11, 1950. "Item 673½ — For printing reports on geological formations and other characteristics of the James River Basin . . . $10,000. It is hereby provided that if and when the geological reports are printed, as provided in Item 606 of the Acts of 1948 session of the General Assembly, that any monies derived from the sale of these reports shall go to the Virginia Academy of Science." Hence, money received from the sale of the James River Monogoraph is available as a revolving fund for publication of additional major volumes pertaining to the James River Basin. Thus continuation of the program of the James River Project as originally established by the Long Range Planning Committee and authorized by the Academy is assured. Members of the James River Project Committee and the Long Range Planning Committee are making preliminary plans for further development of the James River Basin studies.

As part of this report and for the published records of the Academy, I wish to include the brochure (see p. 303), which is being distributed as an announcement of the publication of the Monograph.

THE VIRGINIA ACADEMY OF SCIENCE

Announces

Publication of

THE JAMES RIVER BASIN

PAST, PRESENT AND FUTURE

COMPILED BY THE JAMES RIVER PROJECT COMMITTEE

Bound in blue buckram with title and seals of the Academy and State of Virginia in gold.

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MARCELLUS H. STOW, CHAIRMAN

James River Project Committee

Virginia Academy of Science

Lexington, Virginia

This comprehensive monograph depicts Conservation, Recreation, Education, Biological Sciences, Earth Sciences, Mathematical Sciences, Applied Sciences, Industry, and Transportation in the James River Basin. It represents a study of what is known about the past and present conditions and discusses problems that await initial study or require more detailed scrutiny in order to extend scientific, economic and sociological knowledge of the region. It is written on a high plane of careful scientific research and contains factual material intelligible to the scientific, economic, sociological, and political leaders of the State of Virginia and others interested in regional development and progress.

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It would be impossible to mention the names of all who have contributed to the chapters of the book and who have been of assistance to the Chairman during its compilation and publication. To all, I extend

my sincerest thanks, but I cannot close this report without mentioning by name the two members of the Academy who fundamentally are responsible for the book, and to whom it is dedicated: Justus H. Cline and Wortley F. Rudd.

MARCELLUS H. STOW

After the reports of the committees were made and accepted, the following report of the Constitution Revision Committee was made by Sidney Negus.

REPORT OF CONSTITUTION COMMITTEE

CONSTITUTION*

ARTICLE 1 NAME

The name of the organization shall be the Virginia Academy of Science.

ARTICLE 2 PURPOSES

The purposes of this organization shall be to encourage scientific research in Virginia and to arouse interest in and appreciation of science among the people of the State.

(a) To discover, encourage and develop scientific interest and ability among the youth of the State by a Junior Academy of Science, by science clubs, by science talent searches and by other means.

(b) To facilitate prompt publication of acceptable scientific papers and abstracts.

(c) To cooperate insofar as practicable with industries in their scientific problems and with other scientific organizations having aims similar to this organization.

(d) To cooperate with those in charge of the Virginia State Science Museum and the Virginia Institute for Scientific Research.

(e) To render public service in scientific matters.

(f) To hold meetings of the Junior and Senior Academies for the better acquaintance of those interested in all branches of science in Virginia.

ARTICLE 3 MEMBERS

Section 1. There shall be seven classes of members: regular, student, contributing, sustaining, life, patron, and honorary life.

Section 2. The first four classes of members are distinguished by the dues which they pay (see by-laws).

Section 3. Life members shall consist of members who by paying the sum of one hundred dollars ($100.00) are exempt from payment of further dues.

Section 4. Patrons shall consist of those persons who have given to this organization the sum of one thousand dollars ($1,000.00) or its equivalent in property. They shall have all the rights and

* Revised from Constitution adopted at Danville Meeting, May 4-6, 1939 (Academy Proceedings, 1938-1939, page 68).

privileges of regular members and shall be exempt from dues. An institution may also become a patron by meeting the above requirements. Its representative shall have all the rights and privileges of regular members.

Section 5. Honorary life members shall consist of persons elected by the Council for long and distinguished service to science in this organization and others no matter where located. They shall have all the rights and privileges of regular members and shall be exempt from dues.

ARTICLE 4 ELECTION OF MEMBERS

Members of all classes except honorary life must be accredited by the Secretary-Treasurer of the Academy and/or the Council. See Article 3, Section 5, concerning honorary life membership.

ARTICLE 5 OFFICERS

The officers of this organization shall consist of a President, a President-Elect and a Secretary-Treasurer.

ARTICLE 6 COUNCIL

The executive body of this organization shall be known as the Council (Trustees). It shall be composed of the President, the President-Elect, the Secretary-Treasurer, the three most recent Past Presidents, the Editor and Technical Editor of its Journal, the Chairman of the Long Range Planning Committee, and of five additional members all to be chosen from the membership. These additional members shall serve for five years in regular rotation, one being elected each year and one retiring each year. In the case of death or other unforeseen interruptions of this routine, the President shall make interim appointments until the next annual election is held. A Past President shall serve for three consecutive years on the Council, thus making his full term a total of five years. The Editor and Technical Editor shall serve on the Council as long as they continue in office.

ARTICLE 7 DUTIES OF THE COUNCIL

The Council shall have charge of the policy of this organization and shall supervise the publication of its Journal, including the appointment of the Editor, Technical Editor, Assistant Technical Editor and Advertising Manager. The term of office each shall be set by the Council.

ARTICLE 8 ELECTION OF OFFICERS AND COUNCIL MEMBERS

A Nominating Committee, appointed by the President, shall submit to the annual meeting nominations for President-Elect, Secretary-Treasurer, and for one or more members of the Council. Nominations from the floor shall be in order. These officers shall be elected annually by the membership and, with the exception of the Secretary-Treasurer, shall not be eligible to succeed themselves.

ARTICLE 9 SECTIONS AND AFFILIATED CHAPTERS

Section 1. Any group of members, may with the approval of the Council, organize as a separate Section. Such a Section shall become established after it has conducted one successful program at an annual meeting. Any established Section which fails to conduct a program for two successive annual meetings may be dropped as a Section by action of the Council. Such a Section may be reestablished by the Council after it has conducted one successful program at an annual meeting. If any Section shall plan to adopt a constitution and by-laws, they must be approved by the Council prior to adoption by the Section.

Section 2. Any group of members may, with the approval of the Council, organize Affiliated Chapters wherever deemed necessary. Each new Chapter's constitution and by-laws must be approved by the Council prior to its official affiliation with this organization. Any amendments subsequent to affiliation must also be approved.

ARTICLE 10 MEETINGS

The annual meeting of this organization shall be held on the first or second Thursday, Friday and Saturday of May in each year at a place selected by the membership. The Council shall decide whether the annual meeting shall be held the first or second Thursday, Friday and Saturday in May and shall arrange for any special meetings deemed necessary.

ARTICLE 11 BUSINESS

Section 1. Forty members of this organization shall constitute a quorum for the transaction of business at regular and special meetings. Seven members shall constitute a quorum for the transaction of business by the Council. No votes by proxy shall be cast at any meeting.

Section 2. The fiscal year of this organization shall be from April 1 to March 31.

Section 3. The parliamentary procedure of this organization shall be governed by Robert's Rules of Order, Revised.

Section 4. This constitution may be amended by two-thirds vote of those members responding to a mail ballot sent to the entire membership, provided such amendment shall have been introduced in writing at a previous regular meeting, and due notice of proposed change shall have been given in writing to each member.

SIDNEY S. NEGUS

It was properly moved, seconded, and passed, that the revised Constitution as proposed by the Committee be accepted as the new Constitution for the Virginia Academy of Science.

The following report of the Committee on By-Laws was next discussed and several recommended changes were made before it was properly moved and passed that the By-Laws be accepted as changed.

BY-LAWS OF THE VIRGINIA ACADEMY OF SCIENCE

As Approved at the General Meeting, May 11, 1950

Section 1. Annual Dues:

(1) The annual dues of regular members shall be three dollars ($3.00).

(2) The annual dues of student members, graduate or undergraduate students in the colleges or universities of the state, shall be one dollar ($1.00). Student members shall have all the rights and privileges of regular members except they shall not receive its official publication, THE VIRGINIA JOURNAL OF SCIENCE.

(3) Members who pay annual dues of five dollars ($5.00) shall be designated Contributing Members.

(4) Members and institutions which pay annual dues of ten dollars ($10.00) shall be designated Sustaining Members.

(5) A Regular, Student, Contributing or Sustaining Member in good standing must not be in arrears in dues for more than one year. Any such member not in good standing because of non-payment of dues may be reinstated upon payment of dues in arrears.

Section 2. Duties of Officers:

(1) The President shall be the directing head of the Academy, shall preside at business meetings and general sessions of the organization, and shall appoint the members of the standing committees and of new committees authorized by the Council.

(2) The President-Elect shall assist the President as mutually agreed between them, and shall serve as President in the latter's absence. He shall furnish the Academy at its annual business meeting with a list of committee memberships which he has set up to assist him during his year as President.

(3) The Secretary-Treasurer shall keep a complete record of each annual meeting, and of other meetings held during the year by the Council, and shall prepare a report of their proceedings for publication. He shall keep the membership lists of the Academy in up-to-date fashion, shall promptly supply the Editor-in-Chief of the JOURNAL with the names of all new members and shall likewise supply the Editor of the JOURNAL, on January 1 of each year, with

the list of all members whose dues are paid by that date. He shall periodically supply the Secretary of each Section with a list of the paid-up members of his respective Section. The Secretary-Treasurer shall receive all funds—except as provided below under Section (5), (2), shall disburse all funds as directed by the Council and approved by the President and/or Chairman of the Finance Committee—with checks being countersigned by one of these, and shall submit at the annual meeting a written report of all receipts and disbursements. His annual report shall be accompanied by an audit by a recognized public accountant. He shall furnish quarterly financial summaries to the officers and to the members of the Council and of the Finance Committee. He shall be adequately bonded.

(4) Officers shall serve ex-officio on all committees of the Academy.

Section 3. Reimbursement of Officers:

The President and President-Elect shall serve without reimbursement. The Secretary-Treasurer shall receive an honorarium of three hundred dollars ($300.00) per year.

Section 4. Representation at Meetings:

Where representation at national meetings and on formal academic occasions is desirable, the President shall designate Academy representatives from among persons known to be planning attendance at those meetings. No officer or other Academy member shall receive compensation for attending meetings, scientific or otherwise, either within or without the state of Virginia—except for attendance of the Secretary-Treasurer, or in his absence some presidential designate, at the annual meeting of the American Association for the Advancement of Science, in order that the Academy may have a continuity of representation at Council Meetings of the American Association for the Advancement of Science. In the case of this exception, the upper limit of the representative's expenses, to be paid by the Academy, shall not exceed one hundred ($100.00) annually.

Section 5. The Virginia Journal of Science:

(1) THE VIRGINIA JOURNAL OF SCIENCE shall be the official publication of the Virginia Academy of Science, and as such shall carry approved articles summarizing scientific research work, appropriate news items (in as restricted a space as feasible), most announcements to the membership concerning Academy activities, and the Program for, and the Proceedings of, the Annual Meeting of the Academy.

(2) For each dues-paying Member, except Student Members, two dollars ($2.00) shall be turned over to the JOURNAL each year. When members in arrears pay back dues, two dollars ($2.00) shall go to the JOURNAL for each year in which the Member has been supplied with issues of the JOURNAL while in arrears. Where members have pledged and paid two additional dollars, for each of the

first two years of the reinstituted JOURNAL, these monies shall be paid to the JOURNAL. All monies accruable entirely to the JOURNAL (such as subscriptions without memberships, advertisement revenues, exchange fees, gifts, etc.) shall be collectable by, and paid directly to, the JOURNAL. The JOURNAL shall finance itself from the above-mentioned amounts, and from such other sources as become available, and shall set aside such sums as possible for any future urgencies.

(3) All members, except Student Members, shall receive the issues of the JOURNAL. Subscriptions to the Academy JOURNAL will be discontinued for those Regular, Contributing, or Sustaining Members who have not paid their dues by January 1 of each year.

(4) The staff shall be composed of: an Editor-in-Chief, a Technical Editor, an Assistant Technical Editor, and an Advertising Manager—all elected by the Council—and of Section Editors, with one representative, known as Section Editor, elected from and by each of the Academy's Sections. All members of the staff shall be elected for terms of five years (except that in reinstituting the JOURNAL the several Sectional Editors were elected for terms of two, three, four, and five years, respectively, in order that a rotation of experienced editorial personnel might be assured.) In case of vacancies due to retirements, deaths, or other reasons, the positions shall be temporarily filled by the Council, from recommendations furnished by the Editorial Staff, until the time of the next Annual Meeting, at which time the positions shall be filled for the remainder of the unexpired terms by the groups responsible for the original appointments.

(5) The Editor-in-Chief shall solicit all invited articles for the JOURNAL, shall prepare or see to the preparation of all news items and announcements for the JOURNAL, shall keep mailing lists that are up-to-date, shall make all new address plates and shall mail all JOURNALS (including Proceedings), shall keep financial accounts on the JOURNAL, shall pay all bills and care for all business, including an annual audit of the Books, of the JOURNAL—subject to the regulations and approval of the Academy Council.

The Technical Editor shall receive all scientific articles for the JOURNAL, shall send these to the appropriate Sectional Editors for refereeing, shall act as a referee himself, and shall edit all material published in the JOURNAL.

The Assistant Technical Editor shall aid the Technical Board in such ways as requested and advantageous.

The Sectional Editors comprising the Editorial Board shall aid the Editor and Technical Editor in refereeing, and in securing additional referees for, scientific articles within their respective fields; in preparing proper announcements and news items for the JOURNAL; and in such other ways as may be advantageous.

The Advertising Manager shall be responsible for securing the proper amount and type of advertising material for the JOURNAL.

(6) No staff member of the JOURNAL shall receive remuneration for either work or travel, but shall be supplied with such materials as are used in the way of stationery, postage and similar items.

Section 6. Committees:

The Council shall have the right to establish appropriate standing Committees, and such special Committees as, and when, needed.

Section 7. Changes in these By-Laws:

These by-laws may be changed or amended at any annual meeting of the Academy by vote of a majority of those present at the annual business meeting, provided due notice of such proposed change has been given in the VIRGINIA JOURNAL OF SCIENCE, or in writing to each member, prior to such annual meeting.

WALTER S. FLORY, JR.

There being no further business the meeting adjourned at 11:55 p. m.

FOLEY F. SMITH, *Secretary*

Report of the Luncheon of Collegiate Members

As was announced to the Academy at its meeting on May 11, 1950, a luncheon for the Collegiate members was held in the Ballroom of Hotel Roanoke on Friday, May 12. From the comments of those attending the luncheon it could be adjudged to be a complete success. Attending the meeting were students from Radford College, Virginia Polytechnic Institute, Roanoke College, University of Virginia, Hollins College, Lynchburg College, University of Richmond, Virginia Military Institute, Washington & Lee University, Randolph-Macon Woman's College, and Longwood. Also attending were Boyd Harshbarger, President of the Academy; Foley Smith, Secretary-Treasurer of the Academy; George W. Jeffers, past president of the Academy; H. T. Cox, Faculty Advisor, Virginia Polytechnic Institute Collegiate Chapter; Robert P. Carroll, Faculty Advisor of the Virginia Military Institute College Chapter; J. Gordon Stipe, Chairman of the Committee on Resolutions; Joe W. Guthridge, Chairman of the Committee on Collegiate Activities; and other senior members of the Academy interested in the work of the Collegiate Members.

The total attendance of the luncheon was 102 with about 75 of this number being Collegiate Members.

The main business of the luncheon consisted of self-introduction of each of those attending and a short talk by Alexander J. Mitchell, Acting President of the Collegiate Chapter. After the luncheon the Collegiate Members remained for a business meeting at which time the organization for the Collegiate group for the coming year was discussed. There was a great deal of interest in the furthering of the activities of the group, and due to the fact that most of those attending were seniors in their own schools, there was difficulty in setting up a panel of officers from among the juniors since they knew so little about the activities of the organization.

It was decided to form a Committee of the eleven Juniors attending, and this Committee would work in the coming year for the formation of Collegiate Chapters in the other schools in Virginia. C. Ray Fauber of Virginia Polytechnic Institute was chosen to be Chairman of the Committee and to direct its activities.

With the interest developed at the meeting this year, the Academy should be able to anticipate a luncheon meeting of about 200 at next year's Academy Meeting in Lynchburg, and the formation of several additional Collegiate Chapters during the coming year.

JOE W. GUTHRIDGE

Minutes of the Dinner Meeting

President Harshbarger presided at the Dinner Meeting, Friday, May 12, attended by 138 members and guests. Mr. Harshbarger introduced the members and guests at the Speakers' table, then introduced Miss Randolph, President of Hollins College, who extended greetings to the gathering from one of the Host Institutions. Mr. Oberley, President of Roanoke College, was next introduced. He extended greetings from Roanoke College as co-host institution.

In the absence of H. R. Hanmer, Chairman of the Research Committee, John Forbes, of the Medical College of Virginia, presented the Horsley Award to Erling S. Hegre, associate professor of anatomy at the Medical College of Virginia.

Dr. Hegre's study, "A New Research Tool and Technique for the Biologist", deals with the development of a method of study of histologic details at various levels through a specimen without preparing serial sections in the usual sense. It enables one to see microscopic structures in their true normal relationship to each other without the distortions which have come to be expected in serial sections. With this method, one may follow the course and changing relationships of a structure from level to level at intervals of only one or two microns and one may make such observations from the vantage point of a comfortable seat and watch a photographic record unfold the anatomy in an uninterrupted sequence upon a motion picture screen. Dr. Hegre's motion picture and paper on a new research tool and technique for biologists offers a new approach to the study of the minute anatomy of biologic specimens.

Dr. Forbes also announced that the Research Committee had awarded Honorable Mention to Donald M. Britton, Research Fellow, The Blandy Experimental Station, University of Virginia, for his highly meritorious paper on "Cytogenic Studies on the *Boraginaceae*."

Following Dr. Hegre's short summary of his work, Sidney S. Negus, immediate past President of the Academy, presented the report of the Nominating Committee. This report nominated for President, Guy W. Horsley; President-Elect, Paul M. Patterson; Secretary-Emeritus of the Academy, E. C. L. Miller; Secretary-Treasurer, Foley F. Smith; and L. W. Jarman as the member of Council to succeed Miss Gillie Larew.

On proper motion it was seconded and passed that the nominations be closed and the report of the Nominating Committee was unanimously accepted.

J. Gordon Stipe, Jr. presented the report of the Resolutions Committee. The following resolutions were adopted:

1. BE IT RESOLVED that the Virginia Academy of Science express its appreciation to the Local Committee on Arrangements, headed by Paul M. Patterson and Ashley Robey, to the Hotel Roanoke and the

Norfolk and Western Railway, to the commercial and educational exhibitors, and to the many others whose efforts have contributed to this unusually well organized and successful meeting.

Be it further resolved that the Virginia Academy of Science give thanks to Hollins College and to Roanoke College, the host institutions for this meeting.

2. BE IT RESOLVED that the Virginia Academy of Science commend the Committee on the James River Project and its chairman, Marcellus Stow, for the successful completion of a distinguished monograph.

3. BE IT RESOLVED that the Virginia Academy of Science acknowledge its indebtedness to the committee which re-established the *Virginia Journal of Science,* to the staff for the high quality of this journal, and to all members of the Academy who have contributed to the support of this journal.

IN MEMORIAM

Dr. Edward Steidtmann, Lexington, 25 May 1948

Dr. Frank Redwood, Norfolk, 27 May 1949

Dr. Roy S. Cook, Fredericksburg, 18 June 1949

Dr. Chauncey McL. Gilbert, Charlottesville, 2 October 1949

Edward R. Stettinius, Jr., Rapidan, 1 November 1949

Bradford Walker, New York City, 29 November 1949

R. P. Cocke, Williamsburg, 8 January 1950

Dr. T. B. Hutcheson, Blacksburg, 8 April 1950

Horton H. Hobbs, Jr. reported that the Committee on Place of Meeting for 1950-51 had accepted the invitation extended by Lynchburg College, and this recommendation was unanimously accepted. President Harshbarger, at this time, formally recognized Mr. and Mrs. J. Wortley Rudd. Mr. Rudd is Dean-Emeritus of the School of Pharmacy of the Medical College of Virginia and former President of the Academy. The Secretary was then called on for remarks concerning membership in the American Association for the Advancement of Science.

President Harshbarger called on Dean Ivey F. Lewis who acknowledged the debt of the Academy to Marcellus Stow, Chairman of the James River Project Committee, for his meritorious work and that of his committee in producing the long-awaited Academy Monograph entitled "The James River Basin — Past, Present and Future."

President Harshbarger at this time recognized Dr. E. C. L. Miller and Mr. Justus Cline. Following this, Mr. Negus installed the new officers with the following comments:

"As an appropriate way of installing Dr. E. C. L. Miller as Secretary-Treasurer Emeritus of the Academy for the coming year, I suggest a rising vote of appreciation for his many contributions to the success of this organization for over a quarter of a century.

"It is a pleasure to install Foley F. Smith as Secretary-Treasurer of the Academy for 1950-51. Only those who have worked directly with Foley on some project know how thoroughly and conscientiously he goes about getting things done in the background. He deserves the thanks of all of us for being willing to continue the more or less thankless job of keeping the Academy records in good order.

"We are fortunate in having L. W. Jarman willing to serve as a member of the Council and Paul M. Patterson as President-Elect. They will be of great help to the Academy's program in the future.

"With Dr. Guy Winston Horsley as President of the Academy the coming year, this leading scientific organization of its kind in the country is sure of continued success. Dr. Horsley was born in Richmond, Virginia, in February, 1905. He earned his B.S. and M.D. degrees at the University of Virginia in 1925 and 1929 respectively. During 1929-1930, he served as an interne at St. Elizabeth's Hospital, Richmond, and then for 12 years was associated there with his father, Dr. J. Shelton Horsley. From 1942 to 1946, our incoming president saw active military service as Chief of the Surgical Service, 45th General Hospital, with overseas duty of approximately 30 months in North African and Italian Theaters. He was also Chief of Surgery at McGuire General Hospital, Richmond, Virginia. He was awarded North African Theater ribbons with two battle stars, and the Legion of Merit. He was discharged as a Colonel.

"In 1946 Dr. Horsley returned to civilian practice and is at present attending Surgeon at St. Elizabeth's Hospital. He is also at present Associate Professor of Surgery at the Medical College of Virginia, Surgical Consultant for McGuire Veterans Administration Hospital, Richmond, President of the Virginia State Board of Medical Examiners, and Vice-President of the Virginia Division of the American Cancer Society.

"This is the first time in the history of the Academy that a son of a former President has been elected to this high office in Virginia science. Dr. Guy Horsley's internationally known father, Dr. J. Shelton Horsley, was the Academy's distinguished president in 1926-27. The present endowment of the Academy, nearly $16,000, was envisioned and almost entirely raised by our new president's father. His son is an exceptionally busy surgeon but he is willing to give of his valuable time during

the coming year, partly in memory of his revered father, I suspect, to the leadership of the scientists of Virginia.

"Since Dr. Horsley obtained his undergraduate and graduate training at the University, I think it would be most appropriate in these installation proceedings for the first President of the Academy and Dean of the University of Virginia, Dean Ivey F. Lewis, to symbolize with a hand-clasp our sincere determination to back our 28th President, Dr. Guy W. Horsley, and our other officers, to the very best of our abilities during the coming year."

President Harshbarger then turned the meeting over to the incoming President who made the following remarks:

"I am fully aware of the great honor that has been bestowed upon me in having been elected to the presidency of the Virginia Academy of Science. It is with great humility that I accept this office, as I feel that it is not only an honor for me but chiefly a posthumous award to my late distinguished Father, Dr. J. Shelton Horsley, who was one of the founders and an early president of the Academy. Since the early twenties, when the Academy had its first meetings, until his death in 1946, my Father was vitally interested in the Academy and its development. He and others, like Ivey Lewis, E. C. L. Miller, Sidney Negus, Lloyd Bird, Wortley Rudd, and Marcellus Stow—just to mention a few—molded it into one of the finest State Academies of Science in the United States. I know he would be filled with pride if he could know of the wonderful strides the Academy has made in this postwar period. I believe I can say, without fear of contradiction, that the past year under the dynamic leadership of Dr. Boyd Harshbarger, the Academy has had one of its most prosperous and outstanding periods. In years to come I am sure we will all refer to 1949-50 as one of our peak years and use it as a yardstick to measure our accomplishments and a goal to strive for each year. Dr. Harshbarger's boundless energy, his foresight, and his gift for organization are admired by the entire Academy, but more especially by the older members who in former years have striven for many of the accomplishments that Dr. Harshbarger has made a reality. To name a few — during his presidency the Virginia Journal of Science has been re-established, which in itself is a remarkable feat, and also during this time the Section of Teachers of Science has been organized and Collegiate Chapters at Virginia Military Institute and Virginia Polytechnic Institute have been chartered and added to the Academy.

"In passing, one must not forget the yeoman's work done by our able and pleasant Secretary-Treasurer, Foley F. Smith. He has completely re-organized the financial records and bookkeeping of his office so that now the Finance and Endowment Committee can obtain a very accurate status of the finances of the Academy and also prepare a budget for the coming year. During the past year he has revised the entire mailing list of the Academy.

"I believe Dr. Harshbarger and Foley Smith would be the first to say that their accomplishments during the past year could not have been achieved except for the diligent and faithful assistance given them by the chairman and members of all of the various committees.

"We have another year ahead of us and with the help of all of you, your committees, and the Council, I can only hope we will be able to hold all of the gains given to us and continue onward with the same projects and programs."

Following the new President's remarks, Mr. Harshbarger presented the speaker of the evening, Mr. Russell Poor. His address is carried in full as the feature article in the July, 1950 issue of the Virginia Journal of Science.

The Dinner Meeting adjourned at 10:45 p. m.

FOLEY F. SMITH

Minutes of the Council Meeting

The meeting of the Council on Saturday, May 13, was held in Parlor K of the Hotel Roanoke, Roanoke, at 10 a. m. The following were present: President Guy W. Horsley, Paul M. Patterson, John N. Buck, Ladley Husted, Horton H. Hobbs, Jr., Boyd Harshbarger, Edward S. Harlow, Marcellus Stow, Allan T. Gwathmey, Ivey F. Lewis, and Foley F. Smith.

The meeting was called to order by President Horsley. The first order of business was the election of Dr. E. C. L. Miller, as Emeritus Member of the Council.

Dean Ivey Lewis suggested that because of prohibitive expense of the annual Academy dinner, and the fact that this prevented the graduate students and younger members from attending, the dinner be dispensed with as a formal part of the meeting, unless the cost of such dinner could be held to a minimum of $2.00 per plate. This was properly moved, seconded, and passed.

The Secretary was instructed to reprint the membership leaflet for the year 1950-51, including the list of Jefferson Award winners, in addition to the Horsley Award winners. The Jefferson award was discontinued in 1944.

Allan Gwathmey offered the use of storage space for the permanent archives of the Academy at the Virginia Institute of Scientific Research in Richmond, subject to approval of their Board of Trustees. On proper motion it was seconded and passed that the Secretary inspect the space, and if suitable, to collect the files of Section officials and set up permanent archives of the Academy. He also suggested that sets of the old *Virginia Journal of Science* and *Claytonia* be bound, and made a part of the permanent archives.

The question of Section meetings continuing through Saturday morning was discussed. It was felt that since most sections now try to rush through their programs in order to finish them Friday afternoon, resulting in much crowding and confusion, it was suggested that possibly the increase of papers by undergraduate students would lengthen the program, and necessitate the sections having programs Saturday mornings, thereby allowing more time for papers and generally improving the quality of the program. It was suggested that section officers be invited to the Council meeting in October, and that both the Editorial Staff of the Virginia Journal of Science and the Local Arrangements Committee also be asked to attend. The suggestion was placed in the form of a motion and properly passed.

Cadet Mitchell of Virginia Military Institute reported on the meeting for the organization of Collegiate Chapters of the Virginia Academy of Science. He discussed the results of the meeting of the college stu-

dents, which was to set up such chapters and formulate their policies. A meeting was planned at Virginia Polytechnic Institute in September for the newly elected Executive Committee. At this time plans are in progress for Chapters at Radford, Randolph-Macon Woman's College, Hollins College, Lynchburg College, and the University of Richmond. Cadet Mitchell was thanked by President Horsley for his efforts in assisting the formation of Collegiate Chapters.

It was moved, seconded, and unanimously passed that Dean Wortley Rudd of Richmond, and Dean Ivey Lewis of the University of Virginia, be made Honorary Life Members of the Virginia Academy of Science for their outstanding and valuable work for the Academy.

Dean Rudd and Dean Lewis were escorted to the Council meeting after this action, and were personally so notified in the presence of the Council by President Horsley.

There being no further business the meeting adjourned at 12:15 p. m.

FOLEY F. SMITH

Minutes of the Virginia Junior Academy of Science Meeting

The 8th Annual Meeting of the Virginia Junior Academy of Science was called to order in Room 12 of the Lucas Chemistry Building of Roanoke College at Salem, Virginia, at 2:00 p. m. Thursday, May 11th, by the president, Pete Giesen, of Radford High School.

The president then introduced the president-elect, Billy Graham, of Wilson Memorial High School and secretary, Nellie Mae Bloxom, of Newport News High School.

The secretary called the roll. The following schools were represented:

Blacksburg High School
Booker T. Washington H. S.
Eagle Rock High School
Episcopal High School
George Washington Carver H. S.
Hampton High School
Hargrave Military Academy
Jefferson High School
Lane High School
Lexington High School
Madison Heights High School
Newport News High School
Norview High School
Portsmouth High School
Radford High School
Ridgeway High School
Robert E. Lee High School
Thomas Jefferson High School
Warren County High School
Wilson Memorial High School

The minutes of the 1949 convention which was held at John Marshall Hotel in Richmond were read by the secretary, Nellie Mae Bloxom.

Professor Andrew Murphy of Roanoke College, in his lecture titled "Chemistry as a Vocation," emphasized that the importance of understanding science in a democracy cannot be overestimated. "Lack of understanding," explained Dr. Murphy, "accounts for the feeling of being spiritually lost." Dr. Murphy concluded his lecture by explaining and giving examples of the three principles of scientific progress.

Announcements were made by the Housing Committee and Club Project Judge Chairman, F. S. Andrews.

Raymond Kirby, of Norview High School was elected president-elect and William Peach, of Newport News High School was elected secretary.

George Graves, of George Washington Carver High School, in a talk titled "A Possible Cure for Tuberculosis," related his experiences as a child when he first became interested in a self-made drug. This drug was first used and proved successful on rabbits.

B. N. Cooper spoke briefly on "Science Teaching Program in Schools and Colleges." Dr. Cooper stressed the fact that with an increasing interest in science, more people are going to be needed for scien-

tific careers. "I think the kind of program which would be most effective for high school teachers is a program of the basic scientific principles," said Mr. Cooper. He pointed out that the success of an individual in college depended on the job that had been done in high school.

The president, Pete Giesen, then introduced Dr. E. C. L. Miller, founder of the Virginia Academy of Science.

The meeting was adjourned at 3:45 p. m.

NELLIE MAE BLOXOM, *Secretary*

Minutes of the
Virginia Junior Academy of Science Banquet

The Virginia Junior Academy of Science Banquet was held in the Roanoke College Commons at 6:30 p. m., May 11. Pete Giesen, president, presided.

Boyd Harshbarger, President of the Academy, greeted the guests and members.

A welcome was extended by Dr. Sherman Oberley, president of Roanoke College.

F. S. Andrews and B. N. Cooper announced the scholarships to be awarded to science teachers and exhibit winners. These are contained in their report.

The address of the evening was made by Walter S. Flory, vice-director of Blandy Experimental Farms, of the University of Virginia.

SCIENCE AND TECHNOLOGY

You are presumably a group of young men and women interested in science — as is signified by your presence here. Many of you — in all probability — will wish to continue and expand your interest in science. Where this proves true, in your own individual cases, you should clearly understand the objectives of science, the objectives of technology, and the present day dependence of technology on science. These are simple things to understand. Yet they are misunderstood, or at least misinterpreted, by more than one scientist and technologist. Unless you realize the differences and the relationships existing between science, and technology, you may go on to college or to other further work thinking you are taking up a course of training designed to develop you into a scientist, and actually end up four or six or eight years later a technologist, or vice-versa.

We might go to Webster's unabridged dictionary and find the following definitions containing some nice five-syllabled words. Webster states that science is "accumulated and accepted knowledge which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws of nature" and also "especially such knowledge when it relates to the physical world and its phenomenon — in which case it is called natural science."

Webster further tells us that technology is "applied science as contrasted with pure science," or that technology is any practical art which utilizes scientific knowledge" and gives as examples the fields of "horticulture, medicine, and the industrial sciences."

Before going further I should make an acknowledgement and at the same time call your attention to a recent outstanding presentation con-

cerning the subject of science. While organizing a few ideas to bring here this evening Dr. Sidney Negus was good enough to call my attention to an address entitled "The Place of Science in a Free Society." This was presented by Dr. Henry D. Smyth at Amherst College just about a month ago. Dr. Smyth was on the staff of the Physics Department of Princeton University for many years, and is now a member of the U. S. Atomic Energy Commission. A number of the points brought out by Dr. Smyth concerning science were so nearly in line with my own beliefs that I am quoting from his address at several points, and the convergence of ideas might be noted at other parts of the presentation here.

The distinction between basic science, or *science,* and applied science, or *technology,* is important. The objective of science is to understand the laws of nature, while the objective of technology is the immediate improvement of the material condition of man.

Scientists are motivated by intellectual curiosity. They are driven by a desire to know and to understand the "how" of things, and the "why" of the behavior of nature — whether the case be biological or physical. Dr. Smyth has well said that men of science are characterized "by skepticism and imagination, by an inclination to question accepted views, and by the imagination to construct novel interpretations and theories."

Technologists differ from scientists chiefly, probably, in that their standard of success is *utility* or usefulness rather than *understanding.* Inventors, engineers, practical medical men, agriculturists, and other groups which are composed largely of technologists rather than of basic scientists, are concerned with the usefulness of the machines, or of the methods, or of the techniques involved. An understanding of these, and especially of the natural laws upon which their utility is based, is entirely secondary to the utility itself. New ways of doing things, cheaper methods, more effective mechanical devices, new and better plants, are the aims of the technologists.

Technology is dependent upon science. This was not true in the beginning days of technology. Then, and for a long time, technology consisted largely of simple mechanical devices, levers, wheels, wedges, pulleys, pistons and the like. No deep-founded knowledge of chemistry and physics was necessary to understand the laws by which these worked. This was still true even after the event of the steam-engine. With the coming of the electrical industry in the last half of the nineteenth century, however, this situation began to change in the engineering field and also in other fields.

Today, the casual, scientifically untrained, originator is infrequently encountered. Radio, television and other electronic devices have issued in practically full-bloom from the scientific research laboratories. Hybrid corn, with its greatly increased yielding capacity, has developed almost directly from the theories and the work of the research geneticists. Penicillin, streptomycin, aureomycin, and similar antibiotics

have resulted from the ideas and the work of research microbiologists. The potential list of such discoveries, developments and advancements, by basic scientists, is almost endless. Formerly there was a considerable time-lag between scientific discovery and practical application. This gap, in general, has been steadily shortened. In the mid-thirties the costly cyclotron at the California Institute of Technology was called "Lawrence's Folly" by a portion of the press. Soon, however, nuclear fission was realized with the aid of the cyclotron, and only a few years later the explosion of the first atomic bomb, based on nuclear fission of course, furnished the final dramatic demonstration of the shortening time between scientific discovery and technological application.

Several suggestions have been made to this point. Basic science gives rise, almost directly, to many advances. Science furnishes knowledge of fundamental natural laws in other cases. Technology uses, to a greater or lesser degree as desirable, the knowledge thus acquired by science, and exploits such knowledge for the practical use of man. In many cases the utility thus acquired is beneficial, often very much so, to mankind. In other cases the really beneficial aspects of such utility to man are of questionable value. In any event, science and technology clearly go ahead hand in hand.

This brings us up to a consideration of a relationship between science and technology which is probably of much less interest, now, to our young friends at this banquet table than to the older members of the audience. I will attempt, however, to touch on this relationship as briefly as possible.

The increasing dependency of technology upon basic science has had a number of effects. For one thing it has meant an enormous increase in the funds set aside for scientific research by both government and industry. Welcomed as these funds often are, they nevertheless involve obvious dangers. At times technology, and the technological value of science, may be wrongly considered the main reason for scientific research. Preference may usually be given to projects of techno logical promise, rather than to those of unknown scientific possibilities

Dr. Smyth again points out in excellent wording facts of which most scientists are clearly aware. I quote here at length from him when he considers that when government and industry give preference to technological over scientific projects "Such judgment requires foresight that is beyond the capacity of the human mind. Examples show that the value of science to technology comes from totally unexpected quarters and that the only safe objective to set up for science is the one which it has already set up for itself, an increased understanding of the laws of nature. I believe that this danger is well understood by those now administering the government funds devoted to science and is also understood by men in similar position in industry. It probably is not well understood by men who have no familiarity at all with science and technology. That is the reason why I emphasize the point, since ulti-

mately funds to support science come from ordinary citizens, either through taxes or gifts. At present, the geese that lay the plutonium eggs are being pampered. We must be sure that they are not killed even if they occasionally hiss venomously and behave foolishly, as geese will."

One never knows when the experiments and studies which a creative scientist makes to appease his intellectual curiosity may unearth another finding not only of great interest to the scientist and his colleagues, but also of immense value to the technologist. In 1935 not even the wildest imaginations of a Buck Rogers creator could have envisioned the effects which the scientist and his cyclotron would exert on the war infested world of 1945 nor on the thinking and conditions of the world of 1950.

Applications of the technologist can be rather carefully planned and logically developed *when* knowledge of the basic natural laws involved is at hand. Such applications are virtually impossible without the knowledge furnished by the fundamental research scientists. The fruitfulness of the true scientist cannot be regulated by plan nor by regimentation. Often the methods of a scientist are somewhat intuitive, and it has been said that scientists in their creative instinct and temperament are much closer to artists in their procedures, than they are to the practical applied scientists such as let us say — a rule-of-thumb engineer.

The part which basic science plays toward the technological advances of a given subject is probably nowhere more apparent than in the field of agriculture. Dr. Gordon Whaley's 1949 article in the journal SCIENCE entitled "The Agricultural Impasse" well-summarized the facts bearing on this point. I want to quote some of his observations as follows: "We are now at a point where major agricultural advances can come only after we have gained much more knowledge concerning the fundamental biology of our crop plants. Improvement in field practices may be expected to give perhaps another ten percent in increased yields. It will result in some saving of land and it will bring further lightening of the farmer's labors. This sort of progress must be continued, but major advances will come only if we supplement such investigations with enough basic biological research to enable us to begin to learn something more than superficial facts about how plants grow, how they reproduce, and what their relations to soil and climate are. . . . The agricultural research agencies are tending to neglect seriously the biological problems which are at the base of the next century's improvement in agriculture or even the next century's continuation of agriculture at its present highly productive level."

Dr. Whaley believes that the serious biological problems are being neglected, sometimes for lack of time to deal with them, and often on the assumption that the universities of the future will produce a generation of men better prepared to deal with them. The last assumption of

course is not necessarily true *a priori*. An additional reason for possible neglect of biological problems so pertinent to the real progress of practical agriculture may be the disproportionate emphasis in the amounts of funds allotted to the practical, as compared to the basic science, branches of agriculture and biology.

The important thing, from the standpoint of this group, is that the frontiers of science have scarcely been crossed as yet. We are just now finding, if we wish to be facetious, for example, that one plus one does not equal two, but does equal two and a half — in some cases at least. There is a catch in this, of course, and in this case the catch is found in the effects of a chemical reaction. Laboratory and laundry tests show that sometimes when equal quantities of two cleaning compounds are mixed their combined ability to clean is greater than the sum of their separate abilities. Somehow they stimulate one another like two good friends. Two so-called "builders" which have this characteristic are sodium tripoly phosphate and tetra sodium pyro-phosphate manufactured by the Monsanto Chemical Corporation. When either is combined with a synthetic detergent, for example, it boosts beyond expectations the compound's ability to remove soil.

It may be repeated that the surface of science — the study and determination of natural laws and truths — has been scarcely scratched. And, of course, as more becomes known about the workings of nature the wider are the developmental opportunities of the applied sciences.

Some of you may receive happiness — in the days to come — by having your native curiosity quieted as to how nature behaves as it does in some certain respects. In other words you may find the study of natural sciences, and eventually scientific research, an engrossing procedure. Others of you may not have much curiosity as to just how or why nature acts in certain ways, but you may derive your supreme satisfaction from utilizing the knowledge acquired by your brothers, in order to increase the comforts of man, and incidentally to better your own personal estate. In either event the opportunity is there; the road is long and the way is wide.

May I give a word of advice? At your stage in life may I suggest that more is necessary than in interest in science, plus a high I.Q. rating, to grasp this opportunity. May I earnestly recommend, whatever your background, that you work diligently to acquire a sound foundational basis in all aspects of science and particularly in the science of your choice. The real opportunities come to those who are prepared to seize them, and not to those who are merely interested in grasping them.

Color slides were then shown to members and guests, after which the meeting was adjourned.

NELLIE MAE BLOXOM, *Secretary*

Tabulation of Registration

1.	Agricultural Sciences	21	1	22
2.	Astronomy, Mathematics and Physics	49	31	80
3.	Bacteriology	10	4	14
4.	Biology	70	47	117
5.	Chemistry	77	51	128
6.	Education	13	2	15
7.	Engineering	18	21	39
8.	Geology	29	25	54
9.	Medical Sciences	25	16	41
10.	Psychology	36	8	44
11.	Science Teachers	16	2	18
12.	Statistics	8	5	13
	No designated Section	32	57	89
	TOTAL Senior Academy	404	270	674
Junior Registration				108
	TOTAL REGISTRATION			782
	1949-50 Richmond Meeting Registration			1083

Minutes of the Section of Agricultural Sciences [1]

S. B. FENNE, *Chairman*
S. F. THORNTON, *Vice-Chairman*
M. M. PARKER, *Secretary*
T. J. NUGENT, *Section Editor* (1951)

FRIDAY, MAY 12 — 9:15 A. M. — PARLOR H

1. Trends in Research on Vegetable Crops.

V. A. Tiedjens; *Virginia Truck Experiment Station*

This paper emphasized the importance of a broad point of view having in mind not only the plant but the animal that ate the food. Emphasis was placed on a broader evaluation of plant foliage symptoms as indicators of nutrient needs, a recognition of the importance of nutrition in plant disease and insect control, and a closer tie up between plant and human nutritionists. The importance of cultural practices, plant breeding and environmental factors in the production of a desired quality demanded by the consumer was stressed.

2. The Use of Sulphur Dioxide for Preserving the Top Layer of Silage.

P. M. Reaves and R. A. Sandy; *Virginia Polytechnic Institute.*

Liquid sulphur dioxide was used to see if it would preserve the top layer of corn silage. The liquid sulphur dioxide was applied from a drum under pressure to a depth of 10 inches to the top layer of the silage.

One silo was opened after 4 weeks. This one had been covered with sisal kraft paper. There was only a very small layer of spoiled silage on top of this silo. The silage for a few inches immediately under this layer was very pungent with the products of sulphur dioxide and was not palatable. This reduced to a large extent the amount of spoilage on top of this silo compared to the usual amount of spoilage.

The second silo was opened at the end of 4½ months after treatment. This one was not covered with paper. There was spoilage over the entire top layer of this silo to a foot or more in depth. Under this the silage was still hot. It was very noticeable that this material was bright in color and did not have the usual browning that you find under the layer of rotten silage.

It appears that sulphur dioxide applied as this was, would prevent spoilage on the top layer of the silo for a few weeks but would not prevent spoilage over a long period of time.

It may have some value when a silo is party filled and then an interval is to elapse before more of the material is blown in the silo.

3. New Fungicides for Tomato Late Blight Control.

S. A. Wingard and R. G. Henderson; *Virginia Agricultural Experiment Station.*

Fungicidal dusts were applied to Rutgers and Southland varieties of tomatoes to determine their relative efficiency in controlling late blight. The materials used were 10, 20, and 65 percent zineb (zinc ethylene bisdithio-carbamate), Tribasic Copper Sulfate (7 percent metallic copper) and Robertson's Copper Dust (7 percent metallic copper). Twelve applications were made at weekly intervals beginning July 1. The test was set up as a split-plot design, using four replications. The fruits were harvested once a week, and graded and weighed.

All the fungicides were effective in reducing the disease incidence which resulted in greatly increased yields of marketable fruit over the untreated check plots, with the average yield in tons per acre as follows: 10 percent zineb, 10.68; 20 percent, 14.49; 65 percent, 13.1; Robertson's Copper Dust, 11.51; Tribasic Copper Sulfate, 9.85; Check, 1.28. The difference required for significance at the 5 percent level was 3.88 tons. There was no difference in the yields obtained from the two varieties.

4. Results of Some of the Newer Fungicides in Controlling Powdery Mildew of Fall Snap Beans.

R. S. Mullin; *Virginia Truck Experiment Station.*

In the fall of 1949 tests using dust of Ziram (Zerlate), Zineb (Dithane Z-78), Ferbam (Fermate), Tribasic Copper Sulphate, and Sulphur were made on fall snap beans at Norfolk, Va. Rotenone was added (0.75%) to each dust, and the checks were dusted with rotenone alone. The experiment was made in an attempt to determine whether or not some of the newer fungicides would give equal or better control of powdery mildew of snap beans (*Erysiphe polygoni* DC.) than that obtained with sulphur. Eight replications, each of four 40 foot rows were dusted three times during the season. Yield data were taken from the two middle rows of each replication. One picking was made and yields in bushels per acre were as follows: Sulphur 121, Tribasic Copper Sulphate 104, Ferbam 103, Ziram 88, Zineb 81, and Check 76. At harvest considerable mildew was present on all plots except those treated with sulphur. Plants in the Sulphur, Copper Sulphate, and Ferbam plots were much greener than the others and had more foliage. The only marketable beans were produced in the plots treated with sulphur.

5. **The Use of Sulphur Dioxide in the Liquid Form for the Prevention of the Growth of Fungus (mold) in Silage and Hay, the Saving of Nutritional Values Now Lost in the Making of Silage and Hay and for the Treatment of Fungus Skin Diseases.**

Charles W. Johnston; *Virginia Smelting Company.*

Results from the use of sulphur dioxide in agriculture for control of mold and fungus in top of silos are reported. Control of fermentation under anaerobic conditions in silos are presented. Also results in the medical field in curing fungus skin diseases such as Athlete's Foot, and fungus growths and *B. coli* infections in the outer ear are reported.

A very pure grade of the liquid sulphur dioxide was used. Sulphur dioxides in this form enables one to control easily and accurately the quantity applied and the concentration of either the gas produced on evaporation of the liquid, or the strength of the sulphurous acid formed.

The application to the top of silos, whether filled with grass or corn, reduced molding. The treatment of all the grass or legumes put in the silo reduced fermentation, but the grasses were well preserved. More carotene was saved than by other methods, and as fed, the sulfo-silage was very palatable. Costs were less than value saved. Sulphur dioxide can protect what is ensiled when filling has to be stopped for a time, thus increasing the flexibility in the use of silos.

6. **Resistance of Lima Beans to Nematodes at Walkerton, Va, 1949.**

Flood S. Andrews; *Virginia Agricultural Experiment Station.*

Reports from many sections of the United States, including several areas in Virginia, indicate that nematodes cause a serious root knot disease of vegetable crops. The USDA Plant Industry Station, The Oklahoma Experiment Station and cooperators in several other southern states have been breeding and selecting nematode resistant varieties of lima beans for several years.

A comprehensive test for nematode resistance was conducted at Walkerton, Virginia in 1949. In this test, nine selections of bush and vine type limas, including one control variety, were arranged as two Latin Squares. Each Square or block contained 10 rows (replicates) and 10 selections including control, Henderson. Each plot was a single hill, each alternating with single hills of the Henderson.

The index numbers were obtained by examining the roots of each mature plant and rating them as follows: 1—no galling; 2—very slight galling; 3—moderately light galling; 4—moderately heavy galling; 5—heavily galled, and dividing the sum of the index numbers by the total number of plants.

From the data obtained, it is evident that the Henderson variety was much more susceptible to nematode galling than several nematode resistant selections. The index number of the Henderson averaged 4.5. This was markedly and significantly greater than the index number of four of the bush selections which averaged 1.6 and was also greater than the index of four of the vine type-selections which averaged 2.1.

The yield of certain resistant selections was higher than the Henderson. Reports of similar tests from other areas indicate that certain selections may be resistant to specific species of the nematode, but not other species.

7. Some 1945-1949 Notes on the Sycamore Leaf Roller (*Anchylopera platanana* Clem) and Its Control.

G. W. Underhill; *Virginia Agricultural Experiment Station.*

This insect was found to have two generations and to overwinter as larvae in folds on fallen leaves. Pupation began before mid-April, and this stage averaged 22.2 days in 1946. Moths began to emerge about May 1. Eggs were laid on leaves and in May 1946 hatched in about 10 days. All larval feeding was on under side of leaves, at first under a flat tent web in crotches of large veins. When tent was about 1¼ inches long a cradle fold was begun, finally resulting in a tight fold about 2½ inches long. Larvae always made a retreat tube alongside a big vein and all stages cut deep feeding cells almost through upper surface.

First generation larvae pupated in July and August and moths emerged from late July through August. Second brood eggs were laid in August and early September. New-brood white tents began to show in early August.

Parasitism ranged from 0 to 55 percent. Eleven species, six chalcids, three ichneumonids, and two braconids were reared.

Control—Burn fallen leaves during winter. Spray under side of leaves in early May and early August with DDT, 2 lbs. 50% wettable powder in 100 gallons water.

8. Stem Nematode—The Cause of a New Alfalfa Disease in Virginia.

R. G. Henderson; *Virginia Agricultural Experiment Station.*

A disease of alfalfa caused by a nematode, *Ditylenchus dipsaci,* was found near Richmond in the spring of 1948. The buds on affected plants were enlarged, the internodes short, and the leaves on diseased stems were deformed and dying. In August 1948 plots on infected soil were seeded to several new strains of alfalfa, selected by Dr. O. F. Smith, U.S.D.A., for nematode resistance, along with four standard susceptible varieties. The nematode disease developed on the young seedlings during the fall and winter. The Nevada strains were much healthier but differences in susceptibility could be detected among them. By the following spring the stand of the susceptible varieties and that of some of the Nevada strains was essentially depleted. The killing out did not result entirely from nematode infection, but rather as a result of the nematodes working in conjunction with fungus diseases such as black stem and leaf spots. During the summer of 1949 some of the strains made considerable growth. Disease developments during the fall and winter of 1949-50 took a further toll of plants but a number of individual plants, which appeared vigorous and healthy, survived. Plant selections are now being made for propagation and further testing.

9. The Effect of Honeybees on the Pollination of Crimson Clover.

John M. Amos; *Virginia Agricultural Extension Service, Blacksburg.*

Over a three-year period, the quantity of seed obtained from samples of crimson clover blossoms in caged areas was compared to that obtained outside where honeybees were active. Approximately one colony of bees per acre was present. Bees increased the seed yield 263 percent, or more than two and one-half times that where no bees were present.

10. The Effect of Various Fertilizer Treatments on Quality and Quantity of Corn Produced.

J. A. Lutz, Jr.; *Virginia Agricultural Experiment Station.*

In 1949, an experiment was initiated at Brush Mountain, near Blacksburg, Virginia to study the effect of varying rates of phosphate and potash on the quality and quantity of corn produced. This test was located on an area abounding in broomsedge, running briars, poverty grass and an occasional scrub pine. The soil was very low in phosphate, fair in potash, and had a pH of 5.3.

Lime was applied at the rate of one ton per acre before and after plowing. All plots received 150 pounds per acre of nitrogen. P_2O_5 and K_2O were applied at rates of 0, 200, 400 and 0; 96 and 192 pounds per acre, respectively.

Corn on plots without phosphate had definite phosphorus deficiency symptoms during the early stages of growth. Corn on plots treated with phosphate made a vigorous growth from the beginning, matured from 7 to 10 days earlier, contained less moisture and had a higher shelling percentage than corn grown without phosphate.

Phosphate improved the quality of corn and increased the yields from 250 to 300 per cent. Plots receiving phosphate produced more than 100 bushels of corn per acre.

There was little difference in yields where 200 and 400 pounds per acre of P_2O_5 were used. The use of potash did not have any influence on yields.

11. Geology of the Shenandoah of Virginia.

Betty Campbell Cook; *Wilson Memorial High School, Fishersville.*

Awarded $50.00 for the best essay related to agriculture in the Virginia Science Talent Search and read before the Agriculture Section; honorable mention National Science Talent Search.

12. The Effect of Nematocide and Fungicide Soil Treatments on Root-Knot, Pod Rot, Nodulation, and Yield of Peanuts.

Lawrence I. Miller; *Virginia Agricultural Experiment Station.*

Ethylene dibromide, chloropicrin, formaldehyde, cadmium copper zinc calcium chromate, tetramethyl thiuramdisulfide, tetrachloro para benzoiquinone, methyl mercury dicyan diamide, and sodium dinitro ortho cresolate treatments were made to the soil in order to check their effectiveness in control of the root-knot nematode and *Sclerotium rolfsii* on peanuts. Of the chemicals tested, only ethylene dibromide was effective in controlling root-knot. Blight caused by *S. rolfsii*, did not develop in the test area, so comparisons of the effectiveness of the chemicals as fungicides is not warranted. Peanuts grown in ethylene dibromide treated soil produced more and larger nodules on the tap root, larger and heavier roots, and more vines and nuts than non-treated plots.

13. Late Season Build-up of the European Red Mite (*Paratetranychus pilosus* Can. and Fanz.) 1949 in Virginia.

G. W. Underhill; *Virginia Agricultural Experiment Station.*

The European red mite problem is closely tied with late season build-up and winter egg carry-over. Conditions favoring late season build-ups are maintenance of vigorous healthy foliage and reduction of

predator activity with sprays. Good orchard management does these things.

In two 1949 experimental-plat series, one receiving miticide sprays in May and the other mid-June to July 1, the mite population was reduced to almost nil, but all plats had a tremendous late season build-up. This was consistently worse on the treated trees, apparently due to killing of predators. Five well-managed orchards which received recommended dormant or delayed dormant sprays were under observation. There was no injury from mites but they built up in late season and winter eggs were numerous. Predator activity was not affected much, resulting in a slower come-back of mites. The 1949 carry-over was unusually large, but with vigorous foliage and early season mite control a dangerous late season build-up may be expected nearly every year.

Everything points definitely to the placement of one preventive mite spray, either dormant, delayed dormant or petal fall, as a regular annual treatment on the same basis as that for codling moth.

14. Rank Order Evaluation by Use of Triangle Test.

Lyle L. Davis and Milton E. Terry; *Virginia Agricultural Experiment Station.*

In every industry where foods are graded or scored and in every food processing plant where certain subjective measures must be made on the quality or on some other characteristic of the food, the problem of evaluating both individual members of the panel and the panel as a whole presents itself.

The problem is more complicated and good testing procedure more necessary as sample size and number of individuals decrease. Quick reliable decisions made from subjective data must always be conditional to the reliability of the panel and its members. This reliability is seldom constant necessitating simple efficient tests.

The triangle test has been used to evaluate flavor, texture, and aroma; it can be used to measure the experience of a panel, the reproducibility of a panel and its members and the influence of environment on the panel. Its primary use is with small sample sizes but it can be used for consumer acceptance with a large number of people.

The test has the statistical advantage of independence among the components allowing the results to be accumulated quasi-sequentially. Tables are given and derived for the acceptance and rejection number of decisions based on Pearson's Approximate Chi-Square.

15. The Role of the Virginia Agricultural Experiment Station in Agricultural Research.

Wilson B. Bell; *Virginia Agricultural Experiment Station.*

Increased efficiency in agriculture, of vital importance to everyone, has been accomplished by ever-widening application of scientific methods to agricultural problems. At first through individual and cooperative efforts, and later through such publically supported institutions as the state experiment stations, many problems, chiefly those of immediate practical concern, have been investigated. The Virginia Agricultural Experiment Station since its establishment by the Hatch Act of 1887 has been contributing to the advance of agriculture. At the present time it is participating in eleven projects designed to solve problems of a regional nature, and is also conducting research on approximately 200 other projects dealing with most phases of agriculture and rural life.

The role of the agricultural experiment stations is to apply the findings of pure research to agricultural problems and in this manner promote man's well-being. The experiment stations should participate

in pure research in order to develop a back-log of fundamental knowledge, that will prevent sterility and decline. Through close cooperation between the investigator in the basic sciences and the investigator in applied fields, the greatest progress can be made. Agricultural science advances by planned cooperation and reliance upon the latest results of pure science for guidance.

16. Full Brother Diallel Cross in Poultry.

James H. Bywaters and Clayton E. Holmes; *Virginia Agricultural Experiment Station.*

In 1949 one 1947-hatched hen which had laid 312 eggs in her pullet year and ten of her 1948 daughters were mated to a son of the old hen. This male was a full brother to the daughters. At the same time another son of the old hen was mated to eight of his paternal half-sisters. Later in the season, these two males were exchanged so that progeny were obtained from both males mated to both groups of females.

An analysis of the 12 week weights of the offspring indicated no significant difference between the two males or between the two series. If all progeny had been of the same sex, the variance would have been reduced about 30 percent.

Most of the dam — offspring correlations within sire were negative. Unequal class frequencies indicate the necessity of making a more complicated analysis.

Minutes of the Section of Astronomy, Mathematics and Physics [2]

THOMAS E. GILMER, *Chairman*
A. MARGUERITE RISLEY, *Secretary*
IRVING G. FOSTER, *Section Editor* (1951)

FRIDAY, MAY 12 — 9:30 A. M. AND SATURDAY, MAY 13

PARLOR A

1. Magnetic Suspension Balance.

J. W. Beams; *University of Virginia.*

An axial magnetic suspension previously used for supporting small steel rotors in vacuo[1] has been found to serve as a very sensitive balance for weighing material. The material to be weighed is attached to a cylindrical ferro-magnetic body, positioned in the edge of a horizontal light beam so that it scatters or reflects light into a photo-electron multiplier cell. The signal from the cell actuates an electronic circuit which regulates the current in the solenoid in such a way as to maintain the suspended ferro-magnetic body at the desired height. By proper adjustment of the rate of change of light intensity with height where the suspended body is positioned in the light beam, the apparatus can be made very sensitive to changes in vertical force on the suspended body. The sensitivity is limited only by the natural fluctuations. For example, with a suspended steel cylinder 10 mil. diameter and 50 mil. long, changes in weight of 10^{-10} gm. could be detected. The material may be weighed in a vacuum or other completely enclosed system. Magnetic suspension balances previously have been designed by Holmes[2] and others[3]. The magnetic balance here described represents a considerable increase in sensitivity.

2. A High Speed Rotating Mirror.

E. C. Smith and J. W. Beams; *University of Virginia.*

A stainless steel mirror which is magnetically suspended in a vacuum, is spun to 20,000 r.p.s. by a rotating magnetic field, the frequency of which is controlled by a piezoelectric crystal oscillator. The speed of rotation is constant and known to a high degree of precision. Lateral motion of the rotor is damped by suspending the core of the support solenoid in a dash pot.

3. Flame Propagation in Cylindrical Tubes at Low Pressure.

L. B. Snoddy, J. W. Beams, E. E. Hackman and J. L. Young, III; *University of Virginia.*

Flame propagation in approximately stoichiometric mixtures of acetylene, benzene and propane with air has been studied at pressures ranging from approximately 1 cm to 4 cms Hg absolute. Combustion was carried out in a vertical tube 12 in. I.D. and 20.5 ft. in length. The mixture was ignited at the lower end of the tube and the progress of the flame front determined by measuring the ionization produced by

1 See Beams, Washington Academy of Science, Vol. **37**, (1947)
2 F. T. Holmes, Rev. Sci. Inst. **8**, 444 (1937)
3 J. W. Clark, Rev. Sci. Inst., **18**, 915 (1947)

the flame at six points spaced 45 in. apart. Pressure changes were detected by a diaphragm strain gauge and the gauge current as well as the ionization current recorded on Brush recorders. All measurements were taken near the minimum pressure at which progressive combustion could be maintained. Speeds of propagation measured with respect to the tube range from 50 ft./sec. with acetylene at 11 mm. Hg to as low as 9 ft./sec. with propane at 27 mm. Hg.

4. Production of High Current High Energy Electron Pulses of Short Duration.

G. W. Clark and L. B. Snoddy, *University of Virginia.*

A single reentrant resonant cavity operating at approximately 405 megacycles has been successfully used to produce high current** high energy electron pulses of short duration. The cavity, which is essentially two quarter wave transmission lines back to back, is driven by a Western Electric 7C22 pulse operated twin triode oscillator. The 7C22 oscillator is supplied from a conventional pulsing circuit operating at 18,000 to 22,000 volts with a pulse length of 5 microseconds. After approximately 4 microseconds from the beginning of the square pulse a quenched vacuum spark, of less than 10^{-7} seconds duration, is produced on the surface of one of the reentrant electrodes inside of the cavity by a special transmission line arrangement. This spark supplies the electrons that are accelerated across the cavity gap. The duration of the electron pulse depends upon the transmission line to the vacuum spark gap and the energy stored in the cavity at the time of the spark breakdown.

At present it is possible to accelerate as many as 2×10^{12} electrons with energies greater than 40 kev in a single pulse lasting less than 10^{-7} seconds. The energy distribution and the time length of the pulse are now being accurately determined as a function of supply circuit constants.

5. The Existence of Photons Under 26 cms. Pb in Cosmic Ray Air Showers.

Frank L. Hereford*; *Bartol Research Foundation, Swarthmore, Pennsylvania.*

Recent data[1] indicate that the frequency under 15 cms. Pb of small cascade showers associated with large cosmic ray air showers is in excess of that expected from the known intensity of penetrating mumesons in air showers. On the basis of absorption data several workers[2] have proposed the existence in air showers of a penetrating lighter meson (about 10 m_e) which could provide a mechanism for local production of these cascades. Although this interpretation has since been soundly discredited[3] further pertinent data are of interest. Accordingly the detection of photons proceeding from this local cascade production has been attempted under a Pb thickness exceeding the maximum penetration depth of cascade showers pre-existing in air (20 cms. Pb). Through modification of a previously described apparatus,[4] a tray of GM counters shielded by an anti-coincidence tray was operated under 26 cms. Pb in coincidence with an unshielded counter system sensitive to large air showers. The insertion of a 3 mm. Pb sheet between the trays under the thick lead shield should enhance the photon efficiency of the lower tray

** L. B. Snoddy and J. W. Beams, Phys. Rev. **75,** 1324 (1949)
* Now at the University of Virginia
1 W. W. Brown and A. S. McKay, Phys. Rev. **76,** 1034 (1949)
2 P. Auger, J. Daudin, A. Freon and R. Maze, Comptes Rendus **226,** 169 (1948)
3 G. Cocconi, V. Cocconi-Tangiorgi and K. Greisen, Phys. Rev. **75,** 1063 (1949)
4 F. L. Hereford, Phys. Rev. **76,** 142 (1949)

through provision of material in excess of the counter walls for production of pairs and Compton recoil electrons. Coincidences were recorded over a four month period beneath a ¾" wood roof with such a 3 mm. Pb sheet alternately in and out of position between the trays. No change in the coincidence rate greater than the statistical error was observed, indicating the absence of an appreciable photon intensity.

6. Determination of Minimum Spark Ignition Energy.

C. A. Gregory, Jr.; *Experiment Incorporated.*

Several experimental setups are discussed for the determination of minimum spark ignition energies of combustible fuel-air mixtures at various pressures. Energies of the order of 5×10^{-4} joules applied in less than 10^{-5} second ignite many fuels at atmospheric pressure. Insulation techniques and the effect of gap length are of paramount importance. The polarity of the high voltage supply has a powerful effect on ignition energies and on the reproducibility of results. Synchroscope displays are employed to investigate the electrical characteristics of the sparks. This work was supported by the Bureau of Aeronautics, U.S. Navy, under Contract NOa(s) 10115.

7. Proofs by "Consecutive Rationals".

B. Z. Linfield; *School of Mathematics, University of Virginia.*

The conclusion that $(1 + h)^{1/h}$ increases as h positive and rational decreases is not only equivalent to

$$\left\{1+\frac{p}{q}\right\}^{p+1} > \left\{1+\frac{p+1}{q}\right\}^{p}$$

where p and q are positive integers,* but is clearly also equivalent to

$$(p + q)^{p+1} > q(p + q + 1)^{p}.$$

Now, letting $x = p + q$; the last inequality is equivalent to

$$x^{p+1} - (x - p) \qquad (x + 1)^{p} > 0.$$

By the binominal expansion the left side is a polynomial in x of degree $p - 1$ with positive integral coefficients:

$$\sum_{m=1}^{m=p} \left\{\begin{matrix} p+1 \\ m+1 \end{matrix}\right\} m x^{p-m},$$

which is obviously positive when x is positive.

8. Internal Errors of Astrometric Plates.

Harold L. Alden; *Leander McCormick Observatory, University of Virginia.*

The various sources of error affecting the internal accuracy of photographic plates have been examined. The most serious are due to the use of comparison stars at large distances from the plate center and to gray images which are insufficiently exposed.

Quantitative relations are given for the former from McCormick plates and for both of these factors for plates taken with the Yale telescope at Johannesburg.

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* Gordon Pall, Limits by "Consecutive Rationals," American Mathematical Monthly, Vol. 56, p. 682.

9. Period-Spectrum Relation Among Classical Cepheids.

Arthur D. Code; *Leander McCormick Observatory, University of Virginia*

The spectral variations of 22 cepheids were investigated throughout their light variation. At maximum light the spectrum of a cepheid most nearly matches that of a supergiant between types F5 and F8, while at minimum the spectrum varies from F7 to K3 as the period increases from one day to fifty days. If a plot of spectral type at maximum and at minimum against logarithm of the period is made, it is found that the spectral type of all classical cepheids at maximum is approximately the same. The near-equality of the spectral type at maximum light for cepheids of all periods suggests that the unreddened colors obtained should be nearly the same, with a slight increase to the red with increasing period due to the increasing luminosity. The normal colors of cepheids are found to be the same as that of normal supergiants of equivalent type.

The value of the period-spectrum relation in this form for problems of galactic structure and absorption is clear. It is necessary only to make color observations of cepheids at maximum light, assign the normal color of a F6 or F7 supergiant, and then determine the color excess. The assumed color will not be in error by more than 0.1 magnitude.

10. Efficiency of the Thermoelectric Process.

G. Preston Burns; *Mary Washington College of the University of Virginia.*

Formulas for the efficiency of the thermoelectric process have been derived for the following cases: (1) External load is different from the internal resistance of the couple. (2) Couple delivers maximum power. (3) Efficiency of the couple is maximum. The maximum efficiency of the process is given by

$$\text{Efficiency} = \frac{e^2(T_h - T_c)}{e^2T_h + 8\rho k + 4(\rho k)^{1/2} \quad (e^2T_h + 4\ \rho k)^{1/2}},$$

where e is the thermoelectric power of the couple, T_h the temperature of the hot junction, T^c the temperature of the cold junction, ρ the specific electrical resistance and k the specific heat conductivity of the elements. If both elements of the couple are made to satisfy the Wiedemann-Franz-Lorenz relation and the temperatures of the junctions are 27°C and 427°C, respectively, then for maximum efficiency the external load is 3.91 times the internal resistance of the couple. For e = 1000 microvolts per degree centigrade this yields an efficiency of 33.9 percent.

11. A Simple Sound Interference Experiment.

I. G. Foster and J. B. Newman; *Virginia Military Institute.*

The Quincke apparatus, used to demonstrate the interference of sound waves, has been adapted for use as an experiment in the elementary physics laboratory. An audio-oscillator serves several sets of apparatus, and earphones are used as individual speakers. Results obtained by the student are reasonably accurate. "White light" interference can be demonstrated readily by using two or three frequencies simultaneously.

12. Systems of Numbers.

John William Layman, Honorable Mention, National Science Talent Search, *Blacksburg High School, Blacksburg.*

13. A New Method for the Study of Flow Through Screens and Other Fabric-like Structures.

S. E. Penner and A. F. Robertson; *Institute of Textile Technology* (Introduced by George H. Coleman).

In order to better understand the mechanism of the flow of fluids through screens, grids, or other fabric-like structures, a method has been devised which permits its investigation by visual and photographic means.

The apparatus consists essentially of a viewing chamber; fluid circulating system with velocity measuring devices; light source with a periodic interrupter and lens system; and a permanently mounted camera. The method is unique in that the construction material of the viewing chamber and model is not only transparent, but has the same refractive index as the fluid used. This allows almost unobstructed visualization of the flow phenomena throughout the entire volume of the viewing chamber. Air bubbles in the liquid reflect the periodic illumination, producing discontinuous streamlines on a photographic film. Since the length of each track may be measured and the time of illumination is known, the velocity distribution may be determined.

The models investigated are intended to represent an enlarged interstice of a screen or open weave fabric. Observations are made at Reynolds numbers up to 400 for various positions of the plane of illumination with respect to the model.

14. Dissociation of Sodium Chloride by Electron Bombardment.

James B. Newman, *Virginia Military Institute.*

In mass spectrographic analysis of a solid, ions are usually obtained either by heating the sample directly and subsequently ionizing the evaporated material or by bombarding the sample with an electron beam and ionizing the emitted atoms with a second beam. The question arose as to whether or not in the latter method the bombarding electron beam removes material from the sample entirely by a thermal process. Dart[1] observed an enhancement in evaporated material from ZnO under electron bombardment above that expected from purely thermal evaporation. This conflicted with subsequent work and opinion of Plumlee[2] that no such enhancement occurred.

This question has been investigated by a method other than that previously employed. With constant energy put into the sample by the electron beam, the relationship between observed loss of mass of the sample and the bombarding electron velocity should give some indication as to the mechanism for removal of material from the sample. NaCl was chosen as the substance bombarded.

The results indicate that the greater part of the material removed is evaporated through a thermal process and although there is evidence for an enhancement of evaporation under electron bombardment, this evidence could not be considered conclusive.

15. The ν_3 Fundamental of Nitrous Oxide.

K. B. Rhodes* and E. E. Bell; *Mendelhall Laboratory of Physics, The Ohio State University, Columbus, Ohio.*

The infrared spectrum of the previously unresolved ν_3 fundamental of nitrous oxide has been recorded with a self-recording grating spectrometer which was operated in a vacuum. High resolution of the rota-

1 Dart, F. E., Thesis, Cornell University, 1946
2 Plumlee, R. H. Report, Ninth Annual Conf. on Physical Electronics, M.I.I., April, 1949

tional fine structure was obtained using a 10 centimeter cell with the gas at a pressure of 2 centimeters of Hg.

The line frequencies were determined and combination relations used to evaluate the band center and rotational constants. The band center was found to be 2224.4 cm^{-1} and the difference between the rotational constants, B′ - B″, was evaluated as -0.00343 cm^{-1}. Combination relations also yielded a value of 0.4200 cm^{-1} for B″.

The intensity pattern of the spectrum was uneven. This uneveness was thought to be caused by the superposition of an upper stage band, i.e., one which arose from absorption by molecules which were initially in the energy level $v_2 = 1$.

16. A Magnetic Suspended Ultracentrifuge with Air Turbine Drive.

J. D. Ross; *University of Virginia.*

A drive has been developed to bring a full sized ultracentrifuge rotor up to speed while the rotor is magnetically suspended. When the rotor has reached a working speed, the turbine is cut loose and the rotor allowed to spin freely. Rotary speeds up to 500 r.p.s. are possible with the present design. In an eight hour run the rotor was found to have an average de-acceleration of one revolution per second per hour, when turning at 325 r.p.s. in a chamber evacuated to pressure of 10^{-4} millimeters of mercury.

17. DISCUSSION: Physics in Virginia Education.

Led by A. D. Campbell; *Hampden-Sydney College.*

18. Use of "Chronotron"* for Resolving Time Sequences in Spectral Phenomena.

Fielding M. McGehee; *University of Virginia.*

A modified chronotron is being developed for an investigation of the relative order of appearance of spectral lines in spark discharges Special features of operation of photomultiplier input circuits to the chronotron and of the time ranges obtainable have been investigated. Precision of the order of 2 - 3 x 10^{-9} seconds seem possible, which is difficult to achieve by other methods of measurement.

Applications to other high speed phonomena will be discussed.

19. A Coincidence Scintillation Counter Apparatus.

Forrest P. Clay; *University of Virginia.*

A coincidence counting circuit has been constructed for use with scintillation crystals for the recording of gamma-gamma and beta-gamma coincidences. The scintillation flashes from two cadmium tungstate crystals are picked up by two 5819 RCA photomultiplier tubes, the output pulses from which are fed into a differential coincidence circuit[1] employing crystal diodes. After amplification and discrimination the coincidence rate is recorded with a scalar. The circuit shows good performance in the counting of the coincident annihilation quanta from a positron source.

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* "Simplified Chronotron—Type Timing Circuit," Keuffel, Rev. Sc. Inst. 20, 3, 197, March 1949.

* Now at Virginia Military Institute, Lexington, Virginia.

1 G. A. Morton and K. W. Robinson, Nucleonics 4, 2, 25 (1949).

20. Electron Optical Schlieren Method Applied to Measuring Contact Potential Differences and Investigating Electric Fields at Surface of Single Metal Crystals[1].

Douglas Venable; *University of Virginia.*

A modification of an electron optical schlieren method is applied to measuring the contact potential difference between two pieces of dissimilar metal. This is a unique direct-reading method of making this type of measurement on very small objects. In addition field disturbances on the surface of single metal cyrstals are being investigated by the same sort of scheme.

21. An Improved Form of Rigidity Modulus Apparatus.

H. Y. Loh; *Virginia Polytechnic Institute.*

In the rigidity modulus apparatus generally used, the angle twisted is measured by a graduated circular scale coupled with a vernier which permits readings to one tenth of a degree. In the present form, the angle is obtained by measuring the tangential displacement by means of an optical lever. Readings down to one hundredth of a degree or less can be accurately determined. It is not only more sensitive but also simpler in construction.

22. A High Voltage Rectified Alternating Current Source for Spectrum Analysis.

Warren H. McInteer; *Virginia Polytechnic Institute.*

This paper describes the development of a rectified a.c. source of from 3500-7000 volts, and an investigation of its properties for spectrum analysis.

A study was made of the relationship between potential difference, current and arc length, and of the effect of ballast resistance.

The sensitivity of this source to trace elements in graphite electrodes was studied and certain elements were detected in quantities too small to be revealed with the 220 volt direct current source.

Spectrum lines from the element sulphur were obtained in the visible region using this source whereas sulphur lines could not be obtained under the same conditions when using the 220 volt direct current source.

23. The Curriculum for Physics Majors at the Virginia Military Institute.

S. Murray Heflin; *Virginia Military Institute.*

The presentation and discussion of the curriculum taken by the students majoring in physics at the Virginia Military Institute.

24. Phase Changes in Thin Film Interference.

I. G. Foster; *Virginia Military Institute.*

A criticism of the more elementary textbook presentations of the question of phase change on reflection is made. The usual statements regarding phase change ignore the effect of plane of vibration of the wave upon its behaviour. A more detailed discussion has the advantage of stressing the point that two waves interfere only if their planes of vibration are nearly parallel.

1 Va. Acad. Sci Proc., 1948-49, paper No. 5, page 82.

Minutes of the Section of Bacteriology [3]

GEORGE MCL. LAWSON, *Chairman*
J. DOUGLAS REID, *Vice-Chairman*
WILLIAM A. DORSEY, *Secretary*
J. DOUGLAS REID, *Section Editor* (1951)

FRIDAY, MAY 12 — 10:00 A. M. — PARLOR L

1. A Study of *Proteus* species isolated from the brown rat.
Donald L. Baxter; *University of Richmond.*

A report was given on the biochemical and cultural characteristics of 40 cultures of *Proteus* and *Proteus*-like organisms isolated from 29 live rats in a study in which intestinal samples were taken from a total of 80 rats. The isolation of *Proteus* cultures was by means of SS agar, lactose, and the urea medium devised by Rustigan and Stuart (1941).

All *Proteus* cultures were subjected to the following biochemical tests: urea, lactose, mannitol, sucrose, maltose, indole, gelatin, citrate, levulose, dextrose, glycerol, and hydrogen sulfide.. The reactions obtained were found to be in close agreement with those found by Rustigan and Stuart (1945).

Of the 40 cultures 12 were *P. vulgaris*, 7 *P. mirabilis*, 1 *P. morganii*, and 13 *P. rettgeri*. Seven cultures were similar to *Proteus* organisms in their ability to hydrolyze urea and failure to ferment lactose, but could not be classified as to species on the basis of their biochemical reactions and were referred to as *Proteus*-like cultures.

It was noted that the percentage of *P. mirabilis* cultures was much lower than the 90% reported by Levine (1942), being only 17.5% in this study.

2. A Bacteriophage Against *Clostridium Perfringens.*
B. H. Caminita and J. E. Faber, Jr.; *University of Maryland.*

A rod-shaped, oxygen-sensitive bacteriophage against *Clostridium perfringens* SR 12 (ATCC 8009) has been elicited from barnyard soil. In electron microscope photographs the particles appear to aggregate end to end and side by side.

3. Antigenicity of Certain Extracts of *Brucella abortus.*
John W. Foster, P. Arne Hansen, and John E. Faber, Jr.; *Department of Bacteriology and Livestock Sanitary Service Laboratory, University of Maryland.*

An attempt has been made to prepare various fractions of *Brucella* antigen and to determine their relative values for immunization, with the object of producing both specific and very active substances.

It has been demonstrated that extracts from cells of *Brucella abortus*, strain 2308, suspended for 24-48 hours respectively in water at 4 to 6 C, in 30 per cent acetone at minus 11 C, in 95 per cent acetone at minus 70, and in dilute buffer at pH 9.2 at 4 to 6 C have some capacity for absorbing homologous and heterologous species antibodies from rabbit antisera. These precipitinogens could be concentrated by precipitation with ethanol in the cold. The acetone and alkaline extracts when inoculated into guinea pigs gave variable degrees of protection, while the aqueous extract failed to give protection. The challenge dose was approximately 10,000 *B. abortus* organisms.

4. The Effect of Gastric Mucin on the Infectivity of Fungi Responsible for Certain Systematic Infections.

Muriel M. Jones; *Medical College of Virginia.*

Yeast phase cells of *Histoplasma capsulatum, Blastomyces dermatitidis, Cryptococcus neoformans* and *Sporotrichum schenckii* were suspended in 5% gastric mucin and inoculated intraperitoneally into mice at the same time as comparable doses of saline suspended organisms. Experiments were terminated in 30 days. Autopsy material was cultured to determine infectivity. Pathogenicities of mucin and saline suspended organisms were compared, strain differences apparent in the pathogenized organisms noted and minimal lethal doses for mucin suspended cells were pointed out.

Gastric mucin was shown to be an effective pathogenizer of the yeast cell phase of the etiological agents of histoplasmosis, blastomycosis and cryptococcosis in the laboratory mouse but of questionable improvement over saline suspensions in establishing sporotrichosis in this animal. Strain differences in infectivity of two strains of *B. dermatitidis* used points to the fact that preliminary establishment of an M.L.D. for each strain is necessary before proceeding to in vivo therapeutic experimentation.

5. Cultivation Studies on *Endamoeba histolytica.*

E. Clifford Nelson; *Medical College of Virginia.*

Through the use of simplified media, a series of studies has been made to elucidate the growth requirements of *E. histolytica.* Reducing agents, certain nutrients and a number of growth promoting substances have been used singly and in a variety of combinations to establish tolerance levels and requirements of the organism.

6. The Influence of Thiamine on the Growth and Colony Appearance of *Sporotrichum schenckii* on a Synthetic Medium.

J. Douglas Reid; *Medical College of Virginia.*

Luxuriant growth and stabilization of growth characteristics of *Sporotrichum schenckii* was made possible by cultivation on a suitable synthetic medium. The incorporation of adequate amounts of thiamine in this medium markedly influenced pigment production. Sabourauds medium, found to be deficient for maximal growth of *S. schenckii,* was rendered adequate by addition of thiamine and phosphate buffer solution.

7. Salmonella and Paracolon species Isolated from the Wild Brown Rat, *Rattus norvegicus, in* the City of Richmond, Virginia.

J. M. Sharpley; *University of Richmond.*

One-hundred and five (105) living animals were used in this problem and one-hundred twenty-five (125) cultures isolated as possible enteric pathogens. Of these cultures eighty-one (81) were discarded as either Coliform, Proteus or Alcaligenes species, while the remaining forty-four (44) were identified as either Paracolon or Salmonella species. Of the latter forty-four (44) cultures there were twelve (12) identified as Salmonella species, including *Salmonella typhimurium, S. newport* and *S. anatum.* Twenty-seven (27) of the cultures were identified as Paracolons and included Bethesda and Ballerup types that are often considered pathogenic. All of the paracolons identified in this study possessed common somatic antigens with the Salmonella.

The animals positive for Salmonella and Paracolon species were plotted and have shown a definite concentration within certain areas of the city. Of nine areas trapped, positive animals were found in only three, and nine of the total positives were found in two of the trapped areas.

8. Training of Public Health Bacteriologists.

Robert F. Smart and J. M. Sharpley; *University of Richmond* and *City of Richmond Health Department.*

A preliminary report on the progress of an in-service training program, between the University of Richmond and the Bureau of Laboratories, Richmond Health Department, has been made. This program consists of senior students that have completed their major in Biology entering a training program in the health laboratories, prior to their graduation. This program is set up to carry five hours scholastic credit per semester and consisted, in the last students accepted, of two-hundred eighty-eight (288) clock hours in the laboratory divided into work in Serology, Bacteriology and Sanitation.

It is the purpose and hope of the cooperating institutions that the preliminary training program, now generally required of students holding an undergraduate degree by health laboratories before entering full-time laboratory work, will be materially shortened or eliminated by this practical experience gaining in a working laboratory.

9. Comparison of Cultural and Microscopic Methods in the Examination of Sputum for Tubercle Bacilli.

Ralph D. Hughes; *Virginia State Department of Health.*

In the examination of 3,002 specimens by both microscopic and cultural methods acid fast bacilli were found in 662 (22.1%), an increase of 9.8% over the number found on microscopic examination alone which was 368 or 12.3%.

Lowenstein's-Jensen medium was found superior to Petragnani's medium for culturing sputum concentrates. Of the 128 positive cultures observed for the amount of growth, Lowenstein's-Jensen medium yielded 58.5% heavy growth as compared with Petragnani's 14.9% heavy growth. 2.5% of the specimens found positive failed to grow on Lowenstein's-Jensen, whereas 44.5% failed to grow on Petragnani's.

The 4% Sodium Hydroxide Method for treating sputum for culture was found preferable to the Trisodium Phosphate Method.

Minutes of the Section of Biology [4]

MARY E. HUMPHREYS, *Chairman*
HORTON H. HOBBS, JR., *Vice-Chairman*
A. M. SHOWALTER, *Secretary*
LADLEY HUSTED, *Section Editor* (1952)

FRIDAY, MAY 12 — 9:10 A. M. — PARLOR B

1. Some Considerations of the Quail Study on the Virginia Polytechnic Institute College Farms.

Walter S. Overton, Jr.; *Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute.*

Evidence has been accumulated which indicates that the size of the population of the bobwhite quail has but little bearing on the size of the following fall population on the Virginia Polytechnic Institute Farms. For the seven years of the quail study on these Farms, the only spring population that fell below 50 quail (50 per cent of the average spring population) produced a larger-than-average fall population of 263 quail.

This phenomenon indicates the necessity of increasing the summer carrying capacity in order to benefit, by way of a larger fall population, from an increase in the over-winter carrying capacity of this area.

Research on improving the summer habitat of quail is at best inadequate, having been handicapped by the lack of an accurate but rapid method of measuring the nesting success.

The data presented by Petrides and Nestler (1942) on the aging of juvenile quail by the progress of the wing molt was utilized in the fall of 1949 on 19 juvenile quail collected on the College Farms. When graphed, the dates of hatching determined by this method give a clear picture of the progress of the nesting season.

In conjunction with the fall population estimate, these data may be used to compare the productivity of two or more areas.

2. The Present Status and Estimated Distribution of the White-tail Deer in Virginia.

James W. Engle, Jr.; *Virginia Polytechnic Institute Wildlife Unit.*

The Virginia white-tail deer is rapidly spreading throughout the state as may be indicated by reports of legal kill from 71 of the counties during the past hunting season. The growing importance of the deer as an animal furnishing recreation can very vividly be shown by the estimated harvest of 267 deer in 1924-25 and the checking station returns of 7,021 deer for the past season of 1949-50; just 25 years later. Further proof of its importance is the growth of big game license sales from 4,938 in 1937 to 43,081 in 1949.

In working on deer problems in Virginia during the past year this writer brought material into the laboratory in which Dr. W. B. Bell found parasites. Dr. W. L. Threlkeld identified these as *Gongylonema pulchrum*, and this identification was confirmed by Dr. John C. Lucker of Beltsville, Maryland. Further collection of gullets from deer during the hunting season disclosed these parasites in 15 out of 18 deer examined from 8 widely separated counties in Virginia. Laboratory examination of the esophagus of the individuals disclosed the worms to be free in the lumen, and imbedded in the membranous lining and the connective tissue. Some mild hemorrhaging was found in these esophagi.

3. A Cytological Study of the Eosinophil in *Lumbricus terrestris*.
Zoe Black; *Mary Washington College of the University of Virginia.*

Cells were stained at pH 6.4 with Giemsa or with Wright's and Giemsa's stains. Stages in differentiation of the eosinophil correspond to those reported by other workers with one exception; this is a neutrophilic leucocyte whose large nucleus is filled with eosinophilic granules. Varying degrees of loss of cytoplasm were noted in this cell type.

Incinerated smears presented proof of the presence of free iron near the nucleus. Vacuoles rimmed with pale red indicated the presence of iron oxide.

4. The Nutrition of the Oocyte of the Fresh-Water Nemertean Worm, *Prostoma rubrum*.
Solomon Kadis; *Miller School of Biology, University of Virginia.*

Prostoma rubrum, the only fresh-water representative of the phylum Nemertea on the continent of North America, is hermaphroditic with self-fertilization being the general rule. The manner in which the oocytes of this animal obtain their nourishment appears to be unique as far as the members of the triploblastic phyla of the animal kingdom are concerned. This involves the direct transfer of nutritive material from the intestinal epithelium to the developing oocyte.

5. Mimicry in Amphibians, with Particular Reference to the Pattern of Southern Mountain Dusky Salamander, *Desmognathus ochrophaeus carolinensis*.
John Thornton Wood; *Virginia Fisheries Laboratory.*

An unusual similarity in cheek pigmentation noted in the red-cheeked salamander (*Plethodon jordani*) and the southern mountain dusky salamander (*Desmognathus ochropaeus carolinensis*) has been reported in the literature as a case of mimicry, the only one known in the amphibia. Another instance, involving the similarity noted in leg pigmentation in the red-legged salamander (*Plethodon shermani*) and the southern mountain dusky salamander has been pointed out as a possible second case of mimicry.

The author, through an analysis of the behavior of the species involved, and through an analysis of pattern in the *Desmognathus* species, postulates that no evidence of mimicry exists in the cases cited above, but that mimicry is a common condition in many species of amphibians.

6. Eggs of the Two-Lined Salamander, *Eurycea b. bislineata*.
John Thornton Wood; *Virginia Fisheries Laboratory.*

For the past 88 years reports have been appearing in the literature listing the number of eggs found with an attending female two-lined salamander, *Eurycea b. bislineata*, in the field. These data have been interpreted as showing the egg complement of this species. Investigations by the author on the number of large ova in gravid females of this species prove that the number of eggs found in the field frequently has no correlation with the actual egg complement. Some of the factors which influence the size of an egg batch in the field include the effects of: (1) Water turbulence; (2) Parental disturbance; (3) Parental destruction; (4) Natural enemies; (5) Multiple depositions; (6) Partial depositions; and (7) Date of observations.

With one exception all literature records report the eggs of this species attached to the bottom of stones over or in running water. Observations on the attachment of the eggs in parts of Tidewater Vir-

ginia indicate they are also attached to logs, rootlets, leaves, and are not infrequently found unattached, lying on the bottom.

The relationship between size of female and number of large ova is demonstrated, and a positive correlation is shown.

7. Observations on the Ecological Distribution of Three Virginia Crayfishes.

Horton H. Hobbs, Jr.; *Miller School of Biology, University of Virginia.*

Many streams of the Blue Ridge and Piedmont Provinces of Virginia are inhabited by three crayfishes, *Cambarus bartonii bartonii*, *Cambarus montanus acuminatus*, and *Cambarus longulus longulus*. Of the three it seems probable that *C. b. bartonii* has the widest ecological tolerance since it is found in abundance in the smallest mountain brooks, in springs, in artificial ponds, and in burrows. Although present in streams of large or intermediate sizes and varying rates of flow it is less abundant, and in certain areas of these streams it is restricted, for the most part, to particular niches. *C. montanus acuminatus*, while being more ubiquitous than *C. longulus longulus*, is most prevalent in sluggish reaches of streams; thus in a stream with alternating riffles and pools this subspecies is almost confined to the latter. *C. longulus longulus* is, ecologically speaking, the most restricted of the three species, and is apparently limited within its range to areas of streams where the water is flowing with a moderate to swift current, where the bottom is strewn with water-eroded rocks, and where there is little silt deposit.

8. The Life History of *Gerris canaliculatus* Say (Hemiptera:Gerridae).

Marvin L. Bobb; *Virginia Agricultural Experiment Station, Research Laboratory, Charlottesville.*

Gerris canaliculatus Say is widely distributed over the eastern United States and is cosmopolitan in Virginia. It is primarily an inhabitant of the surface film of ponds, but has occasionally been collected from the surface of other aquatic habitats. Descriptions of the immature stages and how to distinguish them from those of related species is presented. The total life cycle from egg to adult in aquarium studies ranged from forty to fifty days, and seasonal data on field collected specimens indicated that there were three generations per year. The adults hibernate during the winter under logs, rocks, and other debris along the banks of ponds, and occasionally streams.

9. Male Haploidy in an Anoetid Mite.

Roscoe D. Hughes and Caroline O. Goode, *Medical College of Virginia.*

A mite of the family Anoetidae, *Histiostoma laboratorium* Hughes, is a common genetics laboratory pest which thrives in Drosophila cultures. Preliminary studies indicate that this species has interesting possibilities as a cytogenetic tool. It has a short life cycle of approximately five days at room temperature, a conspicuous sexual dimorphism, a completely heteromorphic deutonymph stage, and is easily and inexpensively cultured. Virgin females oviposit in the normal fashion. All of the resulting offspring, however are males. Fertilized eggs apparently always give rise to females. Male haploidy is thus suspected, and indeed confirmed by the cytological findings which show that the early male embryo has half the chromosome number of the female. This is the first time haploid arrhenotoky has been reported in the Anoetidae.

10. The Genus *Pterodrilus* in Virginia (Oligochæta, Branchiobdellidæ.

Perry C. Holt; *University of Richmond.*

Pterodrilus, a genus of branchiobdellid worms epizootic on crayfish, is inadequately known in regard to distribution and morphology. Several new locality records are given, and the occurrence of possibly new forms of the genus is considered. A description of typical members of the genus is presented, and the necessity for a redefinition of the genus, along with corrections of previous work is indicated. The affinities of *Pterodrilus* appear to lie with the genus *Cambarincola*, and an attempt is made to establish a basis for determining upon morphological evidence the relationships of the genus, using primarily the resemblances in the reproductive systems.

11. Nutrition of Insects.

Warren Moore; *Raphine, Virginia.*

The effects of many substances of nutritional significance on one or more species of insects have been studied. No discontinuity between vertebrates and insects has been shown by the work on the B vitamins or by the limited work on the amino acids. Mineral needs may be different, as evidenced by the ability of *Drosophila* to live without calcium. The lipid requirements of vertebrates and insects show a complete discontinuity. There are indications of the existence of undefined dietary factors.

Owing to the small amount of space and the simplicity of the equipment required and to the fact that a few micrograms of a rare substance is sufficient to determine its activity, experiments with insects offer a convenient, inexpensive method for fundamental biochemical research, as well as for control testing of the adequacy and potency of known substances. Growth studies using black carpet beetle (*Attagenus sp.*) larvae are made by placing one-half to one gram of food in a 2-dram shell vial, adding twenty larvae, and incubating at 80-90° F. and 30-70% relative humidity. At intervals, the insects are sifted from the food and weighed. Eighty-four tests, employing 1680 insects, occupy a space of 12 x 7 x 3 inches. The compounding of a synthetic ration for *Attagenus* larvae is described in detail.

12. A New Research Tool and Technique for the Biologist[1].

Erling S. Hegre; *Medical College of Virginia.*

The apparatus described is designed to cut, stain and photograph serial levels through a specimen embedded in paraffin. By a special method of staining the details encountered at each level are faithfully recorded from the cut surface of the block, thus eliminating the distortions which inevitably occur during the preparation of serial sections by previous methods.

The equipment makes it possible to produce serial photomicrographs. By rapid (movie) projection of the film record one can trace the course and changing relationships of the various component structures in an uninterrupted fashion.

Photomicrographic records of serial horizontal and sagittal levels through embryos of various ages have been prepared. The films are suitable for classroom projection as an aid to the study and teaching of embryology. They can also be used in making reconstructions that are more accurate than those produced by previous methods.

This technique has also been applied to the study of the microscopic structure of individual organs such as the lung of the adult.

1 The complete paper will appear in the January issue of **The Virginia Journal of Science.**

13. Cytogenetic Studies on the Boraginaceae.

Donald M. Britton; *Research Fellow of The Blandy Experimental Farm, University of Virginia.*

Studies of 170 collections involving 24 genera and 100 species of Boraginaceae were undertaken in an attempt to clarify the phylogeny of the group. Inter- and Intra- specific crosses were made in the genera *Echium, Anchusa* and *Cynoglossum*. Evidence from these crosses was used in an attempt to determine the origin of the tetraploid species, *Anchusa azurea* and *Echium vulgare*. In varietal crosses of *Cynoglossum amabile* the inheritance of blue flower color results from the interaction of two dominant factors. Chromosome numbers of 90 species and varieties were determined, ranging from a diploid number of 12 to one of ca. 80. Fifty-two of these were new.

The basic chromosome number for the family is considered to be 8. The majority of the genera have chromosome numbers derived from this basic number. Intraspecific euploidy is rare, species of *Mertensia* and *Myosotis* being the only ones with euploid races. Aneuploid chromosome series are found in many genera.

The author hypothesizes that the center of distribution for the Boraginaceae is in the Old World tropics and that the Old World and New World centers of distribution in the Mediterranean Basin and the southwestern United States are to be considered secondary centers.

14. Fertile F_1 and Backcross Hybrids Between Two *Zephyranthes* Species with Different Chromosome Numbers.

W. S. Flory, Jr.; *The Blandy Experimental Farm, University of Virginia.*

Zephyranthes candida has 38, and Z. *citrina* has 48, somatic chromosomes. The horticultural hybrid Z. *ajax* shows some characters of both the above species, and is intermediate in other respects; it has 43 somatic chromosomes, and is apparently a *candida* x *citrina* hybrid. *Ajax* sets seed profusely. *Ajax* was backcrossed to both of the suspected parents in 1947. Resulting seedlings flowering in 1949 were clearly intermediate in flower color, type, etc. A systematic study of the chromosome complements of the resulting "backcross" hybrids is underway. Some seedlings from *candida* x *ajax* have 40, others 41, chromosomes; some from *citrina* x *ajax* have 45 chromosomes. Seedlings with other numbers may occur. In all, the chromosomes are graduated from quite long, to medium, to a majority quite short in length. Several of the seedlings were selfed in 1949 and yielded normal seed complements of excellent germination. The backcross seedlings are not only apparently quite fertile sexually, but multiply rapidly vegetatively, as do both *ajax* and *candida*. Heiser stated (1949) "that differences in chromosome numbers (apparently) provide a strong barrier to the occurrence of introgression (between species)." In the present instance such introgression appears to occur, and its analysis to be facilitated, by differences in chromosome number and type.

15. The Inheritance of Fruit Shape in a Variety of *Cucurbita moschata*.

A. M. Showalter; *Madison College.*

Selection and inbreeding of the progeny of a single pear shaped fruit of superior culinary qualities through many generations has resulted in widely divergent types; some with large long neck, some with no neck, and some intermediate in shape. Crossing the extremes of these inbred types produces hybrids similar to the original. The pres-

ence of many genes affecting fruit shape in a quantitative manner. is postulated.

16. Heterosis in Populations with a Pericentric Inversion.

Max Levitan; *Virginia Polytechnic Institute* (Introduced by I. D. Wilson).

Individuals heterozygous for a pericentric inversion are expected to possess inferior fertility because crossing over within the inversion would result in duplication-deficiency chromatids. This selective disadvantage is thought to account for the rarity of these inversions in nature. In *Drosophila robusta*, a woods species of eastern North America, two pericentric inversions are found; one of these, 2L-3, is widespread. Its distribution is marked by geographic and altitudinal climes. In experimental populations, each containing 2L-3 and one other arrangement of this arm (2L or 2L-1), and maintained at constant temperature and humidity, rapid directional changes due to natural selection were observed. In some of these the frequency of 2L-3 decreases, while in others it increases. In no case, however, is either arrangement eliminated from the population. Instead equilibria are formed. This indicates that the adaptive superiority of the heterozygotes for these arrangements is responsible for the retention of this pericentric inversion in *D. robusta* populations.

17. Acidity-alkalinity of the Alimentary Canal of 20 Insect Species.

James McD. Grayson; *Virginia Agricultural Experiment Station, Blacksburg.*

Electrometric determinations, using a one-drop glass electrode in a model G Beckman pH meter, were made during 1948 and 1949 of the pH existing in the different regions of the alimentary canal of eight species of caterpillars (Lepidoptera), ten species of adult grasshoppers (Orthoptera), adults of the American cockroach, and the larva of a sawfly (Hymenoptera). Separate determinations were made on males and females for some of the grasshoppers. Average pH values are presented for individual species and for taxonomic groups.

18. Response of the German Cockroach to Sublethal Concentrations of DDT and Benzene Hexachloride: Progress report.

James McD. Grayson; *Virginia Agricultural Experiment Station, Blacksburg.*

Data are presented on reproductive response and development of resistance to DDT and BHC resulting from 6 generations of selection. No real differences in reproductive rate, or abnormalities in development, have been observed so far; however, some resistance to insecticides is appearing in the treated strains.

19. The Use of the Garden Balsam in Laboratory Work of Elementary Biology or Genetics.

Donald W. Davis and Ralph E. Alston; *College of William and Mary.*

Many students in elementary biology have no conception of the processes of plant culture. The garden balsam, *Impatiens balsamina* L., can be successfully used both to instruct beginning college, or indeed high school, students in the raising and care of garden plants and to provide practical confirmation of genetic principles Even students in elementary genetics may profit by these exercises. The writers are prepared to supply a few seeds of parental stocks and F_1s and a number of

seeds of F_2s adequate to give satisfactory dihybrid ratios. With these they can provide descriptions of all phenotypes represented in the cross together with names of genes required for explanations. They offer, also, cultural directions and forms for recording and analyzing results.

This species is unusual in the case and speed with which seeds germinate and plants grow to flowering. One academic quarter or semester is ample for the whole process. For seeds and copies of materials offered, please contact Mr. Davis.

Minutes of the Chemistry Section [5]

A. R. ARMSTRONG, *Chairman*

J. R. TAYLOR, *Secretary*

WILLIAM E. TROUT, JR., *Section Editor* (1952)

FRIDAY, MAY 12 — 9:15 A. M. AND SATURDAY, MAY 13 — BALLROOM

1. Opening Remarks.
   A. R. Armstrong, *College of William and Mary.*

2. Determination of Fluorine in Fluoro-Organic Compounds.
   James W. Cole, Jason M. Salsbury, Lyle G. Overholser, and John H. Yoe; *University of Virginia.*

3. Determination of Small Quantities of Volatile Fluoro-Organic Compounds in Air.
   James W. Cole, Jason M. Salsbury, and John H. Yoe; *University of Virginia.*

4. Determination of Small Quantities of Fluoro-Organic Compounds in Water.
   Alfred R. Armstrong, *College of William and Mary;* James W. Cole, Jason M. Salsbury, and John H. Yoe; *University of Virginia.*

5. Suppression of Cyanogen Bands in Spectrochemical Analysis.
   Ralph E. Thiers; *Pratt Trace Analysis Laboratory, University Virginia.*

In an attempt to increase the sensitivity of spectrochemical analysis, and to eliminate the troublesome cyanogen bands which mask a portion of the spectrum, a device was built which allowed the operation of a spectrographic source in gases other than air. For the direct current arc carbon dioxide was found to be most satisfactory, as it reduced the cyanogen bands to a very low level. It is now used routinely in certain phases of the spectrochemical analysis at the Pratt Laboratory.

6. A Study of the Rare Earth Elements in Human Bones.
   J. E. Johnson and J. B. Lucas; *Virginia Polytechnic Institute.*

The presence of the rare earth elements have been identified in the leaves of many types of vegetable matter. They have been found in all cases of rock phosphate that have been investigated. These facts lead to the assumption that they would also be present in animal bones. Three femurs were selected for analysis. Nothing is known of the history of the subject except that they were adult men and probably above 40 years of age. Ten of the rare earth elements were identified when examined spectrographically, yttrium, lanthanum and cerium gave strong lines. Medium lines were obtained for neodynium and gadolinium. Weak to faint lines were obtained for dysprosium, scandium, europium, lutecium and samarium. Yttrium was determined by spectrographic analysis to be present to the extent of 3.3 parts per million.

7. Determination of Iron and Aluminum as Applied to the Analysis of Georgia Bauxite: Sections I, II, and III.

Bettye Wright Williams, Julia T. Gary, Barbara Montague, and Helen L. Whidden; *Randolph-Macon Woman's College.*

Section I: *Separation and Analysis of Main Constiutents of Ore*

The main constituents of a sample of bauxite from Floyd and Bartow counties in Georgia were separated and quantitatively determined after fusion of a representative sample with sodium carbonate, solution of the melt in hydrochloric acid, and removal of silica. Separation of the iron and titanium from the aluminum was effected by precipitation and removal of the iron as ferrous sulfide, followed by precipitation of the titanium with cupferron. Analysis of the iron was made by ignition of the sulfide to the oxide with subsequent solution in hydrochloric acid and electrolysis of the iron from the solution containing ammonium dihydrogen phosphate and ammonium carbonate, according to Armistead [*J. Ind. Eng. Chem. Anal. Ed. 14, 207(1942)*]. The titanium cupferrate was ignited to the oxide and weighed. The filtrate containing aluminum was analyzed by Snyder's rapid volumetric method [*J. Ind. Eng. Chem. Anal. Ed. 17, 37 (1945)*], using potassium fluoride in an acidimetric titration. The values obtained by these methods for the constituents of the representative sample were: 1.63% Fe_2O_3; 62.09% Al_2O_3; and 0.71% TiO_2. Preliminary separation and analysis of samples containing known amounts of the pure constituents gave results which showed that the method for aluminum was accurate within ten per cent, as indicated by Snyder, and the method for iron was as accurate as ordinary gravimetric and volumetric methods for determination of iron.

Section II: *Colorimetric Analysis for Iron Using* 1,10-*Phenanthroline*

In an effort to simplify and at the same time improve upon previously existing methods for the analysis of iron in its naturally occurring ore, for application to the determination of iron in Georgia bauxite, 1, 10-phenanthroline was used as the reagent for developing color produced, due to the formation of the ferrous-1,10-phenanthroline complex, was measured with the Klett-Summerson photoelectric colorimeter, using a 540 filter.

Factors which were found to influence the analysis were the effect of the presence of aluminum, stability of the colored complex formed, and the effect of hydrogen ion concentration on the formation of the complex.

In solutions containing iron alone, pH was of little importance, and maximum color development was obtained at the end of two hours. In samples containing aluminum as well as iron, it was found necessary to adjust the pH to 2.8-3.5 and to allow twenty-four hours for maximum color development.

Results obtained in an analysis for iron in Georgia bauxite compared favorably with those obtained by other methods in the Randolph-Macon laboratories.

Section III: *Colorimetric and Spectrophotometric Determination of Aluminum*

A colorimetric method for the determination of aluminum using Alizarin Red S was investigated for use with the Klett-Summerson photoelectric colorimeter. Optimal conditions for color development, such as time, temperature, pH, and the effect of light, were checked with solutions of known aluminum content. Solutions of various concentrations of aluminum measured in a colorimeter with a 540 filter

indicated adherence in terms of its oxide. Application of the method to analysis of an ammonia alum for aluminum content proved the method feasible if no interfering ions were present. Iron was shown to interfere in the determination and increased the apparent aluminum content. In order to analyze Georgia bauxite for aluminum, since is also contains iron, a study of iron interference was made. Analysis of known aluminum and known iron solutions with the Beckman DU spectrophotometer indicated maximum absorption at 500 millimicrons for aluminum and 570 millimicrons for iron, rendering direct determination of aluminum in the presence of iron impossible. The aluminum content was determined in known mixtures of iron and aluminum with the spectrophotometer by considering the mixtures as two-component systems. Application of the method to Georgia bauxite after the removal of silicon and titanium but in the presence of iron resulted in an average of 69.55% Al_2O_3. This result was in agreement with those also obtained in the Randolph-Macon laboratories by a rapid volumetric analysis of the bauxite and with the 70.26% Al_2O_3 obtained with the Klett-Summerson photoelectric colorimeter on a sample of bauxite after removal of iron and titanium.

8. Biological Detection of Vitamins in Wool.

Warren Moore; *Raphine, Virginia.*

Black carpet beetle (*Attagenus* sp.) larvae grew slowly on cream flannel cloth supplemented with minerals, choline, pantothenic acid, pyrodoxin, niacin, thiamine, riboflavin, folic acid, and cholesterol. The omission of any of the B vitamins caused a significant decrease in the rate of growth. When cholesterol was omitted, the growth rate was substantially the same as when all supplements were present. It was concluded that the cream flannel cloth furnished cholesterol but not the seven B vitamins.

9. The Preparation of Carcinogenic Hydrocarbons by Aromatic Cyclodehydration.

F. A. Vingiello; *Virginia Polytechnic Institute.*

One particular attack on the cancer problem has been the attempt to correlate molecular structure with carcinogenic activity. Working along this line various research groups have succeeded in synthesizing multi-ring compounds which were proven to be active carcinogens. In many cases the syntheses were long and gave poor yields. Recently Dr. C. K. Bradsher of Duke University has successfully applied the method of aromatic cyclodehydration to the synthesis of two carcinogenic compounds, 9-methyl - and 10-methyl- 1,2- benzanthracene in excellent yield. We are presently engaged in extending this method to the synthesis of 9- phenyl- and 9- substituted phenyl -1,2-benzanthracenes. This paper will describe the progress we have made thus far.

10. The Synthesis of Some *m'* - Substituted Phenyl - *o* - Benzyl-Benzophenones.

F. A. Vingiella, J. G. Van Oot and H. H. Hannabass[1]; *Virginia Polytechnic Institute.*

This paper describes the synthesis of five new *m'*-substituted phenyl - o - benzylbenzophenones. This work is part of a program of research on the mechanism of aromatic cyclodehydration made possible by a grant from the Research Corporation of New York.

Two different paths of synthesis were necessary. Starting with *o* - chlorobenzaldehyde we have been able to synthesize the ketones in

1 Present address: Tennessee Eastman Corp., Kingsport, Tenn.

four steps where the *m'* substituent is methyl, chloro and trifluoromethyl.

For the synthesis of the corresponding fluoro and bromo compounds a seven step procedure was necessary beginning with anthranilic acid and involving the reaction between a Grignard reagent and an acid chloride.

11. Visual Study of Dye Distribution of Cellulose Fibers.

L. C. Pitman, Jr. and Dudley Thompson; *Virginia Polytechnic Institute.*

The purpose of this investigation was to obtain visual information on the distribution of dye particles on a fiber. The electron microscope was used as a research tool in conducting this investigation. The investigation, conducted in the Department of Chemical Engineering at the Virginia Polytechnic Institute, was one of the first known projects in the State of Virginia to utilize the electron microscope for dye study. The importance of the use of this instrument lies in the fact that most dye particles are below the resolution limit of the optical microscope.

The investigation consisted essentially of treating cellulose fibers with six different dyes, examining the fibers under the electron microscope, and reducing selected fields of each specimen to micrographs. The six dyes used were Malachite Green, Indigo, Congo Red, Para Red, Sulfur Black, and Alizarin R; the fiber was bleached sulfite wood pulp. Comparison was made with a representative electronmicrograph of undyed fiber.

12. Ultrasonic Crystallization of Alumina Trihydrate.

Dudley Thompson and J. J. Cassady, Jr.; *Virginia Polytechnic Institute.*

The purpose of this investigation was to determine the effect of ultrasonic vibrations on the rate of precipitation of alumina trihydrate and the equilibrium conditions at the end of the precipitation period.

Under the conditions of the experiment it was found that (1) crystallization was not initiated without a seed charge; (2) the ratio (Al_2O_3/free soda) was inversely proportional to weight of seed charge, standing time after irradiation, and number of irradiations; and (3) the ration (Al_2O_3/free soda) was essentially independent of time or irradiation.

13. The Microscopy of the Effect of Electrolytes upon Clay-Water Suspensions.

W. T. Withers and Dudley Thompson; *Virginia Polytechnic Institute.*

Samples of the three major types of clays, illite, montmorillonite, and kaolinite, were studied with the electron microscope to determine the effects of electrolytes upon the physical relationship of the clay particles which had been suspended in water. The electrolytes employed were sodium chloride, calcium sulfate, and hydrochloric acid. Electromicrographs of treated and untreated samples of each type of clay were made, showing the physical condition at the edge of the particles as well as the relative positions of the clay particles with respect to each other under the action of the various electrolytes. Since the action of these electrolytes is most pronounced in particle sizes below two microns, the electron microscope provided an analytical tool not hitherto available for this type of investigation at Virginia Polytechnic Institute.

14. The Effect of Molecular Structure on Burning Velocity.

A. R. Sharpe, Jr., C. M. Barnett and H. F. Calcote; *Experiment Incorporated.*

Burning velocity data obtained by the Bunsen Burner Method have demonstrated that this phenomenon is dependent upon specific fuel structure. A large number of fuels of saturated and unsaturated straight, cyclic, and branch chain structure, involving oxygen, nitrogen, sulfur and the halogens have been burned in order to determine the effect of such structure on burning velocity. It has been observed that in some instances certain constituents and types of structure increase the burning velocity, while other constituents or variations in the structure have a deleterious effect. For example, unsaturation, cyclic structures, and oxygen, particularly in a three membered ring, tend to increase the burning velocity, while increasing the chain length or degree of branching, as well as the presence of the halogens or the amino group decreases the burning velocity. The magnitude of the effect due to any structural change is inversely proportional to the total number of carbon atoms in the molecule. This work was supported by the Naval Bureau of Ordnance, Contract NOrd 9756, as part of Project Bumblebee.

15. Knocking Characteristics of Fuels with The German Jentzsch Ignition Tester.

R. B. Gilmer and H. F. Calcote; *Experiment Incorporated.*

. The Jentzsch ignition tester is essentially a hot plate type of ignition temperature measuring device developed by the Germans to evaluate fuels for Diesel and Otto cycle engines. The significant feature of the unit is the use of oxygen to simulate pressure so that ignition curves (oxygen flow vs. temperature), roughly equivalent to P-T ignition diagrams, may be obtained. In spite of the apparent witchcraft employed it is possible to evaluate fuel behavior in an engine by the use of certain parameters obtained from the ignition curve.

The apparatus has been tested by determining the ignition curves for pure compounds, mixtures, and fuels containing additives. The results are compared with the critical compression ratios given in the literature. Assuming that the preignition region is important in determining the knock characteristics of a fuel the results indicate a reasonable correlation with engine performance. The instrument may therefore be of some value in practical fuel evaluation without actually making an engine test. The Jentzsch ignition tester has the advantages of fuel economy and simplicity. This work was supported by the Naval Bureau of Ordnance, Contract NOrd 9756, as part of Project Bumblebee.

16. Monomolecular Films.

Anne Louise Davis, Honorable Mention, National Science Talent Search; *Wilson Memorial High School, Fishersville.*

17. A Study of Zinc Compounds.

Camden Ballard Pierce, Honorable Mention, National Science Talent Search; *Thomas Jefferson High School, Richmond.*

18. N-Aryl-N'-alkyloxamides.

A. G. Richardson, J. Stanton Pierce and E. Emmet Reid; *University of Richmond.*

Primary aliphatic amines are identified by reaction with ethyl-N-aryloxamates to form crystalline N-aryl-N'-alkyloxamides.

19. Changes in the Beta-Glucosidase Activity of Sweet Almond Emulsin by Adsorption Methods.

Martha Jean Lowe and Helen Whidden; *Randolph-Macon Woman's College.*

Changes in the beta-glucosidase activity of sweet almond emulsin were effected by adsorption on charcoal, adsorption on Georgia bauxite, adsorption on charcoal and two subsequent tannin precipitations, and by ammonium sulfate precipitation. The charcoal and Georgia bauxite methods produced no appreciable changes, while the charcoal adsorption followed by the first tannin precipitation produced a seven-fold increase in the activity, the second tannin precipitation gave a five-fold increase, and the ammonium sulfate precipitation produced a two-fold increase. The changes were followed by the determination of the rate of hydrolysis of the beta-glucoside salicin. Spectrophotometric curves were made for all preparations and were compared for different activities of the emulsin, as well as for comparable curves of tyrosine and tryptophane, which had been qualitatively determined to be present in emulsin. The region of maximum absorption for all of these was 275-280 millimicrons.

The absorption of the emulsin preparations appeared to result from a combination of the absorption of the tyrosine and tryptophane. No appreciable change in the region of absorption of the emulsin was noticed for the different activities. A similar curve was obtained even after inactivation of the emulsin by heat.

20. Reactions of Tris(hydroxymethyl)aminomethane.

J. Stanton Pierce, Carl D. Lunsford, Ralph W. Raiford, Jr., Julian Lee Rush and Douglas W. Wiley; *University of Richmond.*

The polyfunctionality of tris (hydroxymethyl) aminomethane, $(HOCH_2)_3CNH_2$, (A), makes many reactions with it theoretically possible but few practical. In a study under way, attempts are being made to find conditions for controlled reactions with one or more of the functional groups in (A). Acetals, oxazolidines, 1-aza-3,7-dioxabicyclo (3.3.0)octanes, ureas, thioureas and amides have been prepared from (A).

21. The Preparation of Some Acetylenic Fatty Acids.

J. Doyle Smith; *Medical College of Virginia.*

The preparation of acetylenic fatty acids was begun in an effort to find compounds having bacteriostatic and fungistatic action. The 2-alkynoic acids were prepared by reacting the various sodium acetylides with solid carbon dioxide. Other acetylenic fatty acids were obtained by reacting the various sodium acetylides with alkyl dihalides to produce an acetylenic halide, which was then reacted with a sodium cyanide solution to give a nitrile. This nitrile was hydrolyzed to the desired acetylenic fatty acid. Other preparative methods were used in several instances. The position of the acetylenic linkage in the fatty acid molecule was found to affect physical and chemical properties.

22. A Study of the Light Catalysed α Halogenation of *o* - Benzylbenzophenone.

F. A. Vingiello and R. A. Kasey, Jr.; *Virginia Polytechnic Institute.*

This paper describes the action of bromine and chlorine on o - benzylbenzophenone in the presence of sunlight. The bromination and chlo-

rination reactions have been carried out under various conditions. Although evidence has been obtained which indicates that halogenation takes place, the main product we have isolated is o - dibenzoylbenzene.

This paper also reports the preparation of two new p' - substituted -o- dibenzoylbenzenes and two new p' substituted -1,3- diphenylisobenzofurans. The synthesis of the diketones was accomplished in five steps starting with o - chlorobenzaldehyde. The 1,3- diphenylisobenzofurans were prepared from the corresponding diketones in two steps.

23. The Synthesis of 9- Cyclohexylanthracene and its Purification by Chromatography.

F. A. Vingiello and H. H. Hannabass[1]; *Virginia Polytechnic Institute.*

This paper presents the work we have done in regard to the preparation and identification of 9- cyclohezylanthracene. The synthesis has been carried out by means of two different series of reactions. The first method involves the Grignard reaction between cyclohexylmagnesium bromide and anthrone and the second involves the aromatic cyclodehydration of o - benzylcyclohexylphenone. The final product did not submit to purification by recrystallization but was successfully purified by chromatography to give an analytically pure sample. The chromatographic separation will be described in detail.

24. The Synthesis of Some o′ and m′ Substituted Phenyl - o - Benzyl benzophenones and Some o′, m′ and p′ Substituted o - benzoyldiphenylmethanes.

F. A. Vingiello; *Virginia Polytechnic Institute.*

This paper describes in detail the preparation and characterization of twenty-six new ketones. The complete experimental procedures are given.

The theoretical significance of these compounds in elucidating the electronic mechanism of aromatic cyclodehydration is discussed fully.

25. The Synthesis of o - Benzylketones Having a Strongly Electronegative Group Attached to the Carbonyl Group.

F. A Vingiello and G. J. Buese; *Virginia Polytechnic Institute.*

In connection with the program of research being carried out in these laboratories on the mechanism of aromatic cyclodehydration, we were in need of o — benzylphenones which had a strongly electronegative group attached to the carbonyl group. Two such ketones are o - benzylphenyl - n - heptafluoropropyl ketone and o - benzylphenyltrichloromethyl ketone. We will discuss the work we have done on the synthesis of these two new ketones.

We will also discuss a closely related problem we are working on which is the preparation of a cyclic analog of DDT.

26. The Remodeling of the Chemistry Laboratories at Virginia Military Institute.

L. German; *Virginia Military Institute.*

In 1934, Maury-Brooke Hall which houses the chemistry department, was rebuilt, enlarged, and redesigned in modern fire-proof construction, only the outside walls of the original building being retained.

However at this time all the old desks, troughs, sinks, and fittings were moved back into the remodelled building.

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1 Present address: Tennessee Eastman Corp., Kingsport, Tenn.

Since 1940, the laboratories have gradually been remodelled. It is the purpose of this paper and slides to portray what has been accomplished.

27. The Rate of Diffusion of Mercury Through Pyrex Tubing of Various Diameters.

Richard M. Irby, Jr., annd William E. Trout, Jr.; *University of Richmond.*

In the course of some work carried on by one of the authors at the University of Virginia on the adsorption of hydrogen on copper, it was observed that mercury diffused from a mercury cut-off through 0.6 mm. tubing onto the copper sample, thus poisoning the surface. In attempts to measure the rate at which the mercury diffused through the tubing, an indicator, palladous silicomolybdate on silica gel, developed by Dr. James W. Cole, was first used. Later, palladous sulfate on silica gel was tried. These did not, however, permit the study of the rates of diffusion. In recent experiments, the mercury that diffused through the tubes was condensed on the wall of a tube cooled with solid carbon dioxide and the mercury was dissolved in nitric acid, converted to the chloride, and the amount determined by a method proposed by W. Bernard King and F. E. Brown [*Ind. Eng. Chem., Anal. Ed., 5, 168-71 (1933)*]. Preliminary experiments using tubes of diameters 6 mm., 4 mm., 2 mm., and 1 mm. gave results that agreed fairly well with those predicted by Knudsen's equation for molecular streaming. With some further work it is hoped that controlled poisoning of adsorbents can be studied.

28. X-Ray Studies of Oxide Films on Copper Single Crystals.

Kenneth R. Lawless; *University of Virginia.*

Previous research at the University of Virginia has shown that different faces of a single crystal of copper oxidize at different rates. It is important to know the relations that exist between the structures of the oxide films on different faces and the rates of reaction.

Studies have been made of thin oxide films formed on different crystal faces of copper single crystals. X-ray methods have been utilized to show the polycrystalline or monocrystalline nature of this film and the structural relationships existing between the oxide film and the substrate metal. Certain crystal faces with a high rate of oxidation have been found to have a film of polycrystalline cuprous oxide on them, either with a random or partial orientation. On faces with low oxidation rates, it has not been possible as yet to determine by X-ray methods whether the oxide film is monocrystalline or polycrystalline. After reduction at 200°C, the slow (311) face has been found to be monocrystalline whereas the fast (100) face has been found to be polycrystalline.

29. The Use of Polarized Light for the Measurement of Film Thickness.

Fred W. Young; *University of Virginia.*

The accurate determination of the thickness of thin films in situ is most desirable in the study of reaction rates on metal surfaces. A method for the determination of the thickness of thin films utilizing the change in ellipticity of polarized light which is reflected from the reacting surface was described. This method has the advantages of allowing continuous, nondestructive measurement of film thickness while the reaction is occurring. This procedure is capable of great accuracy; however, the calculations are somewhat involved. This discussion included a brief exposition of the theory and a description of the techniques involved in the manipulation of the apparatus.

30. Some Electrochemical Properties of Copper Crystals.

Lewis B. Johnson; *University of Virginia.*

A definite potential difference is found between the cube, (100), face and the octahedral, (111), face of a copper crystal when immersed in a copper sulfate-sulfuric acid bath. The (111) face is anodic, in agreement with the etch pattern. The potential difference has been found to be almost 6 millivolts in air and about 1.5 millivolts in hydrogen. The polarity of the faces can be reversed by controlling the atmosphere about each. It is believed that these potential differences have a great bearing on corrosion and the varying activities shown by different crystal faces.

31. Certain Aspects of the Growth of Copper Crystals.

John V. Cathcart; *University of Virginia.*

It has previously been shown that in reactions in which a single crystal of copper is used as a catalyst, the reaction rates vary considerably with crystal face. In light of this fact, it seemed desirable to look for methods by which small copper crystals in which only certain predetermined crystal faces are exposed could be produced, the ultimate goal being the development of a very efficient catalyst.

To this end various methods of producing copper crystals were investigated, particular emphasis being placed on the formation of Cu by the gaseous phase reduction of Cu_2Cl_2 with H_2. It was found that copper produced in this manner shows random orientation when deposited on an amorphous substrate like glass but has a preferred orientation on oriented substrates such as mica or another copper single crystal. The depositions on the copper crystal, which is in the form of a sphere, are of particular interest since the sphere may be considered as a unit crystal, and a study of the depositions gives some insight into the mechanism of crystal growth itself.

32. Migration of Copper Atoms Across the Surface of a Massive Single Crystal of Copper.

G. Pedro Smith; *University of Virginia.*

It has been found by workers at the University of Virginia that the surface atoms of a massive single crystal of copper are capable of migrating sufficient distances and in sufficient numbers to produce easily observable changes. Most striking of these changes is the polishing of a rough surface. If a copper single crystal is roughened, for example, by etching in nitric acid, and then heated to 900-950°C. in hydrogen, the migration of copper atoms will smooth over the roughness leaving a smooth surface. Microscopic examination at 2000X will show no roughness on such a surface. Such experiments show a metal surface to be much more mobile than is generally believed.

33. On-Track Research of Chemical Herbicides Applicable to Roadbed Weed Control for Southeastern Railroads.

Jack P. Taylor and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

The R. H. Bogle Company, Alexandria, Va., with the Department of Chemical Engineering at V.P.I., undertook a weed killer research program involving on-the-track tests at six widely scattered locations viz: at Palmetto, Fla., on the Seaboard Air Line, and at Valdosta, Ga., Marion Junction, Ala., Chattanooga, Tenn., Rock Hill, S. C., and The Plains, Va., all on the Southern.

Formulations were developed containing water, sodium chlorate, sodium pentachlorophenate, sodium trichloracetate, ammonium thiocya-

nate, ammate, polyborate, sodium arsenite, 2,4-dichlorophenoxyacetic acid, kerosene, and triethanolamine—oleic acid—water emulsions and modification thereof.

Three series of field tests—late spring, early summer, and late summer were undertaken. Each plot was one quarter mile long and 20 feet wide.

More than $25,000 was expended on this program; it involved approximately 35,000 mi. of travel; tests on 453 one-quarter mile plots, each requiring immediate, one week and one month observations; 330 soil samples were analyzed; with 1,359 still photographs and 6,000 ft. of color motion pictures of the research plots.

Formulations based on sodium trichloracetate are the only effective herbicide for Bermuda grass; that sodium chlorate is an immediate killer for Johnson grass and much of the track vegetation; and that kerosene is only a temporary contact herbicide.

34. The Distribution of Certain Chemical and Physical Properties in the Chesapeake Bay and its Tributaries during the Summer and Early Fall of 1949.

Donald W. Pritchard, Wayne V. Burt, and Dayton E. Carritt; *Chesapeake Bay Institute.*

The distribution of several physical and chemical properties in the Chesapeake Bay and its tributaries, as shown by analyses made during cruises in July, August, and October, are discussed.

35. Reduction of Beta-Nitrostyrenes with Lithium Aluminum Hydride.

F. A. Ramirez, M. Erne and Alfred Burger; *University of Virginia.*

Many important drugs and alkaloids are phenethylamine derivatives. Of the various methods available for the preparation of these compounds the most direct one involves the reduction of substituted beta-nitrostyrenes. Previous to the discovery of lithium aluminum hydride in 1947 no simple laboratory procedure was available and convenient for the reduction of beta-nitrostyrene, although both catalytic and electrolytic methods had been extensively used.

We are now reporting the reduction of various substituted beta-nitrostyrenes with lithium aluminum hydride to penethylamine derivatives. Examples include those with phenolic and halogen groups on the ring and alkyl chains. The yields ranged between 80 and 90%.

36. Literature Survey of Journals in Virginia.

R. B. Gillett, H. R. Anderson, and N. F. Murphy; *Virginia Polytechnic Institute.*

In September 1948, a survey of journals of interest to chemists and chemical engineers engaged in research was instituted at Virginia Polytechnic Institute. This work was started by R. J. Golladay and a report was issued which covered the periodical literature available in the Blue Ridge section of the American Chemical Society. This survey has been extended to the entire state by R. B. Gillett and H. R. Anderson. Included in this survey were all institutional and public libraries, and libraries of all interested industrial plants.

A questionnaire of 230 journals was prepared from published lists. One questionnaire was filled out for each library contacted. Where it seemed likely that considerable material would be located, a personal survey was made.

The results of these investigations are being compiled into one report. Copies of this listing will be made available to all contributing libraries, and to the Virginia members of the American Chemical Society, and other interested persons.

Minutes of the Section of Education [6]

EDWARD F. OVERTON, *Chairman*
R. CLAUDE GRAHAM, *Secretary*
FRANCIS G. LANKFORD, JR., *Section Editor* (1952)

FRIDAY, MAY 12 — 9:30 A. M. — PARLOR K

1. Announcements and Appointment of Committees.
2. Mathematics and Science Offerings in Virginia's Public Schools.
   a. The Mathematics Offering in Virginia High Schools.

      Francis G. Lankford, Jr. and Benjamin T. Cullen; *University of Virginia.*

A study was made by Mrs. Holmes Dumette of the offerings and enrollments in mathematics in Virginia accredited white high schools in the school year 1947-48. The two purposes of the study were:

1. To determine the grade by grade offerings in mathematics in white and accredited high schools in Virginia, and
2. To determine to what extent this offering is elected by high school pupils.

Some of the findings were:

(1) In the main, the high school mathematics program is still composed of conventional sequential courses.
(2) Programs in mathematics follow a rather consistent pattern from grade to grade among the schools.
(3) There are few practical courses outside of General Mathematics.
(4) The percentage of pupils taking mathematics in the late years of high school is very low.
(5) While many texts are used, only a few are used widely. This indicates that there is a rather uniform content for mathematics courses for 1947-48.

   b. The Science Offering in Virginia High Schools.

      Percy H. Warren; *Madison College.*

This paper deals with the science offerings and the science teaching combinations in Virginia high schools. It is not a comprehensive or exhaustive treatment of these topics, but is rather an element in a broader study which I hope to complete within the next year.

The basic data for the paper was obtained from reports made by high schools to the State Department of Education in the fall of 1949. I am greatly indebted to the Office of Secondary Education for compiling and typing the raw data for me.

The material is organized in seven sections. The first section deals with the schools included in the study, the second discusses the number of schools offering each of the subjects in science, the third with the combinations of science subjects offered, the fourth with the different teaching combinations of science subjects represented in Virginia high schools and the number of teachers teaching each of the combinations, the fifth with the different teaching combinations, when both science and non-science subjects are included, the sixth with the number of class periods per day given to instruction in science subjects by teachers who teach one or more classes in science, and finally a few comments.

3. Evaluation and Testing.

a. The 1950 Edition of the Evaluative Criteria.

William R. Smithey; *University of Virginia.*

The six Regional Associations of Colleges and Secondary Schools in 1933 cooperated in making an extensive study of secondary education known as the COOPERATIVE STUDY OF SECONDARY SCHOOL STANDARDS, the purpose of which was to discover effective evaluative criteria: (a) to determine the characteristics of a good secondary school, (b) to find practical means and methods to evaluate the effectiveness of a school in terms of its objectives, (c) to determine the means and processes by which a good secondary school develops into a better one, and (d) to locate ways in which regional associations can stimulate secondary schools to continuous growth. After seven years of extensive work and experimentation, the study brought forth the 1940 Evaluative Criteria which was widely used throughout the United States.

The 1950 edition of the Evaluative Criteria is now in the hands of the printer. The changes and progress made in secondary education during the decade following the 1940 edition have been used to revise this edition. The revision program included a careful review of research material in secondary education, critical examination of the 1940 Evaluative Criteria, the development of revision materials, and submission of the various drafts of these materials to educators for criticism and tryout purposes.

b. The Testing Program of the State Board of Education in Virginia.

Alfred L. Wingo; *State Department of Education.*

The testing program of Virginia's State Board of Education is based upon the hypothesis that standardized tests properly administered, scored, and interpreted can be used as an invaluable help in studying children. This use of standardized tests can lead to an improvement of instruction.

Although using standardized tests to improve instruction is emphasized in the Virginia Program, the results are so organized that they can be likewise used for survey purposes.

The Program

1. Since 1947 the Iowa Silent Reading Test, Elementary Test, has been administered in the eighth grades in Virginia's Schools.

2. In cooperation with the Division of Research and Planning of the State Department of Education, from fifteen to twenty-five local divisions develop comprehensive local testing programs.

3. The American Council on Education Psychological Examination, College Edition, is annually administered to all high school seniors in the State.

4. A portion of the State's funds for testing is used in the promotion of the State Board's program for evaluating high schools through the use of the Evaluative Criteria, prepared by the Secondary School Standards.

4. A Follow-up Study by Upper and Lower Quartile Groups of the 1940 Graduates of John Marshall High School.

Mrs. Elmira C. Maurice; *Bainbridge Junior High School.*

A study was made to determine to what extent the program offered by John Marshall High School was adequate in meeting the

life-preparation needs for its students. Comparison was made of the attitudes, achievements and activities of the upper and lower quartile groups of the 1940 February and June graduating classes, ten years after they had completed their high school education. Information for the study was drawn from data dealing with the past and present status of the group in personal, academic, professional and business life; for their own opinions; from those of their employers and from the personnel of the schools which they have attended since graduation. It is apparent from the study that their high school education has been of value in many areas in fitting these former students to become successful citizens, but it would seem that, with some reorganization and expansion, the program could have met the needs of the group to a greater extent. Three definite needs of the school at that time are indicated in the findings; (1) more flexibility in courses of study, (2) a broadened curriculum, and (3) an expanded guidance program. Modifications to fulfil these needs have been made since 1940.

5. A Study of Certain School Leavers of Mount Pleasant School, Roanoke County, Virginia.

Mrs. Rae Webb Scott, *Mount Pleasant School.*

1. *Problem.* — The problem of this investigation is to study certain pupils of Mount Pleasant School who did not thereafter enter high school, with special reference to the causes contributing to early termination of formal education and the observable results of such termination. The population chosen is that of pupils completing the school's curriculum during the years from 1938 to 1947, inclusive.

11. *Procedure.* — The data in this study are to be collected by using a questionnaire and holding interviews. The instruments used will include items concerning experiences, attitudes and pressure leading to termination; also, items relating to economic security, as well as vocational, personal and social adjustments.

III. *Treatment of Data.* — The data will be examined and summarized using simple statistical techniques in an effort to find typical causes for termination of schooling, also typical results are exemplified in the present status of members of the subject population.

IV. *Purposes of Study.* — It is believed that this study holds promise of discovering important factors leading to termination of pupils' education, that such discoveries will provide basis for strengthening the work of the Mount Pleasant School and other Virginia Schools of which it is typical; also that findings concerning present status have a similar salutory effect.

6. Effects of Perceptual Training On Group IQ Test Scores of Elementary Pupils In Rural Ungraded Schools.

Jack Boger, *University of Virginia.*

Duplicated experiments were performed in white and Negro rural ungraded schools. One white experimental and one white control group constituted the first part of the study; one Negro experimental and one Negro control school made up the second part of the study. There were between 22 and 29 pupils in each group. All groups were given the Otis Quick-Scoring Mental Ability Test and the California Test of Mental Maturity at the beginning and end of the study. Control groups continued the regular school program. Experimental groups received daily training consisting of pictorial and geometric problems, jigsaw puzzles, and wood puzzles for a period of 78 consecutive days.

The gains of both white and Negro experimental groups on the California Test were significant at the one per cent level of confidence. The gains of the Negro experimental group on the Otis Test were also

significant at the one per cent level of confidence; the gains of the white experimental group were significant at the five per cent level of confidence. Non-language I.Q. gains on the California Test were significant at the one per cent level of confidence for both white and Negro experimental groups.

The study suggested that training in visual perception may enable rural pupils to react more efficiently in situations requiring perceptual discrimination and perceptual judgment.

7. Motivation of the Science Student Through Research Projects.

John Thornton Wood, *Virginia Fisheries Laboratory.*

Science students are not motivated by the insatiable curiosity that stimulates the activities of scientists. They are driven on by the effects of positive emotional reactions experienced in the course of studying a science course, including the important influences of "emotional contagion" of the instructor. Student interests are accentuated if the instructor is enthusiastically interested in the subject matter of the course, and in a similar way they are depressed if the instructor is disinterested.

Richardson (1950) reports that "generally speaking the study of science — (in) secondary schools has been primarily the memorization of content" and that the laboratories are being used to recheck known facts through the repetition of familiar experiments. This approach to the subject matter frequently results in boredom of the teacher, an attitude promptly reflected by students finding the course "hard." Improved teaching methods can improve the situation if the teacher's attitude is not the primary interest block.

Teacher and student interest is assured if the teacher plans a basic research undertaking suitable for class participation to be undertaken during the first few weeks of a course.

The author presents, for discussion, a selected group of cases in which he has applied this method.

8. Determining Reading Difficulty of Experiment Station Bulletins.

Alonzo M. Myster, *Virginia State College.*

This paper reports a technique for predicting the difficulty of agricultural experiment station bulletins from counts of certain structural elements. A work sheet, based upon the prediction function, is presented in a form that estimates of difficulty may be accurately made by persons with no knowledge of statistics. It is believed that this scheme should have usefulness in situations where it is desired to obtain estimates of the reading difficulty pupils will encounter when reading is done for purposes of their class work.

9. The Evolving Philosophy of the Junior College With Certain Implications For Higher Education In Virginia.

L. X. Magnifico, *Richmond Professional Institute.*

After several years of study, research, and practical experience in the junior and community college field, this writer is inclined to conclude that, except in several remote areas, junior college administrators and teachers are not actually in accord with educational scientists and theorists.

Unless the junior college, especially the public junior college, actually adopts and practices a philosophy of education which has as its chief tenet assisting youth toward making the transition from later adolescence to adulthood, a chaotic era may be envisioned in the future history of the American junior college, particularly if the decline

of the largely government-subsidized thirst for higher education causes many senior colleges and universities to use their greater prestige in drawing the majority of the thirteenth and fourteenth grade students back to them, whether those students are fitted for higher education or not.

The scope of the junior college is a broad one. Junior colleges or community colleges should direct their efforts particularly to the needs of the later adolescents. The junior college should be neither a preparatory school for senior colleges nor a trade school. The primary emphasis should fall upon helping youth make the important transition from later adolescence to adulthood.

10. Some Reasons Why Students In Colleges and Universities Fail.

A. W. Hurd, *Medical College of Virginia.*

For nearly two years, we have been engaged in the Bureau of Educational Research and Service at the Medical College of Virginia, in studies of students in the medical school, in order to evaluate the factors which make for student success or failure. These studies have led us to the conclusion that the student success and failure are functions of the curriculum, the methods of instruction, the materials and facilities available, and instructor efficiency; as truly as it is of motivations, activities, health, intelligence, aptitudes, and other factors residing in the student himself.

Our studies include all of these various factors. So far we have a considerable accumulation of data on (a) reading ability, (b) aptitude test scores, (c) instructor's grades, (d) occupations of fathers of students, (e) communities from which students come, (f) colleges attended and degrees received, (g) premedical college grades, (h) quality credits received, (i) veterans and non-veterans, (j) married or single status, (k) intelligence ratings, (l) adjustment and personality ratings, (m) case studies, (n) interview charts, (o) new comprehensive tests, (p) prediction of success, (q) progress from year to year, (r) local entrance tests, and the like, for students in all four years of college.

11. A Comparison of the Actual Distribution of 1946-47 State Funds for Public Schools, with a Distribution Based on a Formula Involving Ability, Effort, and Need.

John L. Lancaster, *University of Virginia*

When that portion of the 1946-47 State funds for public schools not appropriated for special purposes is distributed by formula No. 1, the average amount received by the counties per pupil in A. D. A. is increased from $53.17 as under the present law, to $59.84, while the average for the cities is decreased from $40.12 to $19.16. Not all counties would receive larger amounts. Twenty counties and twenty-three cities would receive less.

If the distribution were made under formula No. 2, the average received per pupils in A. D. A. by the counties would be $59.24; and by the cities, $21.07. In this case 25 counties and 23 cities would receive smaller amounts. In 44 counties and four cities, the increase or decrease was less than 20 per cent, while in five counties and 13 cities, the proportionate change was 50 per cent or more.

Business Meeting.

The program of the Section was carried out as published.

The annual business meeting of the Section was called to order by Edward B. Overton, at 4:00 p. m. in Parlor "E" of Hotel Roanoke.

The Committee on nominations, composed of John L. Lancaster, W. R. Smithey and A. L. Wingo, presented the following report:

"Your Committee makes the following nominations:

R. Claude Graham, Chairman
Z. T. Kyle, Secretary
Francis G. Lankford, Jr., Education Editor of the Virginia Journal of Science."

On motion, the nominations were closed and the report of the nominating Committee was adopted by unanimous vote.

A list of the persons attending the 1950 program of the Education Section is attached to the file copy of the minutes.

Minutes of the Section of Engineering [7]

NELSON F. MURPHY, *Chairman*
R. E. L. GILDEA, *Secretary*
NELSON F. MURPHY, *Section Editor* (1953)

FRIDAY, MAY 12 — 9:15 A. M. AND SATURDAY, MAY 13 — WRITING ROOM

1. A Study of Structural Southern Pine.

Oscar Jennings Blake, *Virginia Polytechnic Institute.*

A shipment of 5,591 board feet of dense select structural southern pine, graded and inspected to conform to standard grading rules for southern pine lumber, was carefully investigated in order to determine (1) whether the lumber is within grade limitations, (2) what are the variations in and ranges of its physical and mechanical properties, and (3) whether it fulfills anticipations of design specifications.

Within its limitations, the study indicates that the investigated lumber fulfills the expectations of the National Design Specification despite the fact that some of the planks are found below grade according to the standard grading rules. Hence, those recommendations of the National Design Specification subjected to investigation are substantiated by laboratory test data on a commercially stress-graded shipment of southern pine lumber.

2. Wood Box Columns.

Bertram Y. Kinzey, Jr., *Virginia Polytechnic Institute.*

Box wood columns, defined as those having rectangular, hollow cross-section have not been used in engineered timber structures. No satisfactory design formulas have been established which are based on both theoretical and experimental investigations.

Tests were conducted on 102 columns of dense select structural grade southern yellow pine in order to determine their load-carrying capacities.

Test results were compared with load-carrying capacities determined by an analytical design procedure suggested by F. Wille. Ultimate test loads ranged from 11 to 36 percent lower than values according to Wille's formulas. In developing his formulas Wille did not give satisfaction to certain influences of the non-uniform cross-section on column strength. Therefore, his method is unsafe for designing wood box columns.

3. Introducing a New Improved Nail.

E. George Stern, *Virginia Polytechnic Institute.*

A new general-purpose fastener for wood is introduced. This spirally grooved *Screw-Thread Stronghold* nail combines the desirable features of both spirally grooved *Screwtite* and annularly grooved *Stronghold* nails, thus should be of considerable benefit to all nail users.

4. Determination of the Torsional Stress Concentration in the Fillets of Factor Hollow Stepped Shafts.

E. W. Tobin and W. R. Pierce, *Virginia Polytechnic Institute.*

The determination of the torsional stress concentration factor in fillets of hollow stepped shafts was investigated both experimentally

and analytically. Bonded electric resistance strain gages were used on an aluminum shaft for the experimental analysis. Strains in two fillet radii with four ratios of inner to outer diameters were investigated.

The problem is now being investigated analytically by the Relaxation technique developed by Sir Richard V. Southwell. This problem involves the solution of a second order, partial differential equation in finite difference form. The same dimensionless ratios used in the experimental phase are being used in this investigation in order to compare results.

5. Stresses Around a Loaded Hole in a Quarter Infinite Plate.

W. E. Brunschwyler and D. H. Pletta, *Interstate Equipment Co. and Virginia Polytechnic Institute.*

Marginal stresses around a circular hole on the axis of symmetry of a quarter infinite plate were investigated photoelastically. A load was applied to the edge of the hole by means of a slightly smaller disc of the same physical properties as the plate. Five ratios of marginal width to hole diameter were investigated. Stress concentration factors around the hole, in terms of the load divided by the area of the hole, varied from 1.25 to 4.10 for shear, 1.5 to 3.7 for tension and 2.1 to 5.1 for compression for marginal width to hole diameter ratios of 1.5 to 0.98 respectively.

6. New Method of Designing Shrinkfit Cylinders.

A. P. Carpenito and V. G. Szebehely, *Virginia Polytechnic Institute.*

The determination of the dimensions of shrinkfit cylinders for given physical constants is mostly a trial and error process and several solutions can be established which satisfy the maximum allowable stress requirements. In cases, however, where besides safety, also the weight of the construction must be kept within reasonable limits, this rule of thumb cannot be accepted. In the paper, a rather involved analysis is presented and is put in a final useful form by means of nomograms.

7. Observations on Orifice Plate Stresses at Pressures Excess of 20,000 P. S. I.

B. A. Niemeier, *Experiment Incorporated.*

Experimental results obtained during injection of fluids through orifices of varying diameters, under pressures of 20,000 to 30,000 psi are reviewed on the basis of flat plate stress theory. Investigations including .150 to .440 inches orifice diameters were conducted during the course of this work. Stress analyses of members which did and did not fail have been made in an attempt to correlate the results obtained.. A partial agreement between the observed effects and those to be anticipated on the basis of the above theory was obtained.

8. Two Examples of Prestressed Concrete Construction in France.

P. L. Melville, *University of Virginia.*

Prestressed concrete construction is attracting the attention of American engineers. Countries of Western Europe and France in particular have used prestressing in building some remarkable and bold concrete structures. This paper describes two typical examples of such construction which were visited by the author during the summer of 1949. The first one is the concrete runway of Orly Airport. It is only 6 1-3 in. thick and has performed very well under heavy traffic and high loads of modern international air transportation. The second one

is the highway bridge near Grenoble. The spans are some 180 ft. long and made of precast prestressed "I" beams. The most encouraging results obtained warrant a close study of this economical and efficient method of designing concrete structures.

9. Corrosion Protection of Thin Precast Concrete Sections.

E. F. Massie, *Montague and Betts;* D. H. Pletta and H. S. Robins, *Virginia Polytechnic Institute.*

A new electrical resistance technique for measuring the rate of corrosion of steel reinforcing is described in this paper. The method employs a thin ribbon 0.008″ x 0.25″ as the resistance element embedded in 6″ x 12″ thin panels, and Kelvin bridge sensitive to 0.0001 ohm. The data plotted in dimensionless parameter form enable the *half life* of concrete to be determined at a comparatively early age. The term half life is defined as the time required for the cross-sectional area of the reinforcing to decrease by one-half its original value due to corrosion. Six mixes, three water-cement ratios, four exposure conditions and three depths of cover were examined.

10. Aerodynamic Stability of Oscillating Bridges.

J. B. Eades and C. E. Spruill, *Virginia Polytechnic Institute and Grumman Aircraft Co.*

This project was undertaken to investigate the aerodynamic characteristics of bridge section due to dynamic wind action. The initial tests were made on static models to obtain the aerodynamic characteristics of various sections as a predictable means of estimating stability. However, static tests alone are not sufficient to give conclusive evidence of complete aerodynamic actions, hence the necessity of investigating oscillating models for torsional stability is seen.

In the investigation, the torsional stability of various section types was determined by use of power measurements required to oscillate the models at a constant speed in increasing wind velocities. By proper interpretation of these power requirements the torsional response was noted and the stability determined.

Much of the work was done to validate the theory developed for oscillating bridges and to provide the necessary aerodynamic constants for the equations of motion. Approximate analysis is predictable by static tests, but complete dynamic action is required to provide full analysis.

11. A Demonstration Slide Rule.

Carroll Edward Smith, Honorable Mention, National Science Talent Search; *Huntington High School, Newport News.*

12. Treatment of French Plastic Mass.

Claire June Millhiser, Honorable Mention, National Science Talent Search; *Thomas Jefferson High School, Richmond.*

13. Flow Problems of Variable Viscosity.

V. G. Szebehely, *Virginia Polytechnic Institute.*

Presentation of the generalized Navier-Stokes equations for the case when the viscosity is variable. Using tensorial notation, the physical effect of the terms involved are shown. Suggestions are made regarding the solution of classical problems involving constant viscosity.

A method of attack for operation of cases involving variable viscosity has not as yet been presented. Duhem's and Truesdell's methods are presented and criticized. Important practical cases are given where the viscosity can not be considered constant.

14. Investigation of the Cooling Characteristics of Rotating Liquids.

Stanislaw S. Wulc; *Interstate Equipment Co.*

This paper, analyzing the internal water-cooling of gas turbines, represents as M. S. thesis in Applied Mechanics supervised by Dr. V. G. Szebehely. The density differences due to heating of the water in the blade and drum, combined with the very large force field associated with the centrifugal force caused by the rotation of water, sets up strong convection currents, which resulted in a very efficient heat transfer. Using Prandtl's analogy between heat transfer and fluid friction as the first approximation to the problem, the coefficient of heat transfer is derived and one dimensional temperature distribution along the hypothetical blade is computed.

15. Correlation of Maximum Heat Flux with Critical Driving Force from a Horizontal Copper Surface to the Systems Ethanol-Water and Ethylene Glycol-Water.

F. W. Bull and R. V. Davis; *Virginia Polytechnic Institute.*

Heat transfer data were obtained for the systems ethanolwater and ethylene glycol-water, boiling at 715 mm. of pressure from a horizontal copper surface. The concentrations of ethanol and ethylene glycol were varied with 10 per cent increments of water from 0 to 100 per cent and the heat flux-driving force relationship determined for each concentration. A critical driving force and maximum heat flux were determined from the heat flux-driving curve for each concentration. Heat control problems were encountered and techniques developed to standardize the procedure and to insure satisfactory reproducibility.

The heat flux-drivings force relationships for the nucleate boilings range were compared with published data for horizontal metal surfaces. A correlation of maximum heat flux and critical driving force was made in the form of a nomograph.

16. Effects of the More Common Physical Constants, in Oil-Gas Systems, on the Solubility Properties of Oils.

Floyd H. Fish, Jr.; *Virginia Polytechnic Institute.*

The aim of the investigations at V.P.I. has been to establish a simple method of predicting the "half life" time of evolution and of solution of a gas in an oil, based only on the standard petroleum tests — density, viscosity, etc. — which the ordinary testing laboratory is equipped to carry out. Such a method is desirable in certain design problems wherein cavitation and foaming are important considerations.

17. Corrosion of Metals by Glycerine Solutions.

T. F. Lynch and N. F. Murphy; *Virginia Polytechnic Institute.*

The corrosion of steel, cast iron, aluminum and copper in aerated glycerine solutions will be discussed. The effect of temperature, concentration and aeration on the corrosion rate has been determined.

18. Inhibitors for Corrosion of Copper in Phosphoric Acid.

H. D. Decker and N. F. Murphy; *Virginia Polytechnic Institute.*

The inhibition of corrosion of copper in 5% aerated phosphoric acid at 25°C. by diethanol amine, monoethanol amine, monoisopropanol

amine, and triethanol amine will be discussed. Cyanoacetic acid and ammonium phosphate accelerate corrosion. Potassium and sodium chromate and dichromate are also good inhibitors.

19. Effect of Sodium Nitrate on Corrosion Rate of Steel in Five per cent Phosphoric Acid.

R. H. Shackelford and N. F. Murphy; *Virginia Polytechnic Institute.*

The effect of sodium nitrate on the rate of corrosion of steel in 5 per cent, aerated phosphoric acid at 25°C. will be reported. The range of concentration of sodium nitrate studied was from zero to 28 gms. per liter.

20. New Chemical Engineering Facilities for the University of Virginia.

Robert M. Hubbard; *University of Virginia.*

The new chemical engineering laboratory building and its facilities are described. Slides show floor plans and architectural views. Facilities and distinctive features of the building are described.

21. Development of Ultrasonics Program at V.P.I.

Dudley Thompson; *Virginia Polytechnic Institute.*

The application of the phenomenon of ultrasonics to problems in the field of chemical engineering is being developed at the Virginia Polytechnic Institute. Five separate lines of activity are being pursued: (1) construction of ultrasonic generators, (2) design and construction of accessory equipment, (3) investigation of effects caused by ultrasonics, (4) contribution to the literature on ultrasonics, and (5) participation in the national program of the American Institute of Chemical Engineers.

22. Patterns of Chemurgic Industries Applicable to the Virginia Economy.

R. J. Golladay, C. S. Martin, R. L. Havens and Frank C. Vilbrandt; *Virginia Polytechnic Institute.*

The patterns for the development of farm crop industries in Virginia, involving the utilization of farm laborers during the time of the year when their services are not required on the farms, were set up for white potatoes, soybeans, and peanuts. These patterns should be of assistance to the farm economy in areas of the state, where increase in wealth and standards of living are desired and necessary.

Location of the crop industry plants for each crop were evaluated according to raw materials availability, highway and rail transportation for raw materials and marketing of products, and water supply, quality, resources and reserves in various localities. Crop economics, yields per acre, effect of farm practices, costs of growing each crop, soil surveys, soil types in different localities, climatic considerations, such as temperature, rainfall and weather, labor requirements to raise and process the crops were also evaluated in their relation to the specific crops.

Factors of design for various processing stages were made and cost estimations were calculated for the establishment of each crop industry, utilizing 50% of the cultivated area within a radius of 20 miles.

23. Nomograph for Solubility Isotherms for the System: Sodium Sulfate-Ethylene Glycol-Water.

J. D. Phillips and D. S. Davis; *Virginia Polytechnic Institute.*

Predicated on the work of Vener and Thompson (Ind. Eng. Chem., 41: 2242 (1949), data that deal with the solubility isotherms for the sys-

tem: sodium sulfate, ethylene glycol-water have been correlated by means of the equation

$$\log t = a + b C$$

where t = temperature, °C.

C = concentration of sodium sulface in the saturated solution, weight per cent; and "a" and "b" depend on the weight percentage of thylene glycol in the solvent.

Convenient and accurate solution of the equation is effected by means of the two line coordinate charts, one for 0 to 17 per cent sodium sulfate, 25° to 90° C. and 32 to 99 per cent glycol, and the other one for 17 to 33 per cent sodium sulfate, 35° to 90° C., and 0 to 32 per cent glycol.

24. Generalized Relations for Countercurrent Extraction with Constant Underflow.

Robert M. Hubbard and Carey C. Morgan; *University of Virginia.*

By simple material balances, relations are developed to express the concentration of solution in any stage in a countercurrent extraction system, assuming that equilibrium is reached in every stage and that the ratio of solvent in underflow to solvent in overflow is constant for all stages except the first. Generalized relations for any number of stages are presented, and their use is illustrated by examples.

25. The Effect of a Wetting Agent (Sodium Lauryl Sulfate) on the Efficiency of the Fractional Liquid Extraction of Ethanol and Isipropanol with Benzene and Water.

J. O. Gonzalez, Jr., G. L. Patram, W. R. Akers, and Fred W. Bull; *Virginia Polytechnic Institute.*

The process of fractional liquid-liquid extraction offers certain theoretical advantages over simple liquid-liquid extraction. An extraction column was constructed of pyrex pipe, 36 inches long by 4 inches inside diameter. Flow rates of each of the solvents were varied, the rate of introduction of feed, the temperature, and the size of the droplets of the dispersed phase were held constant. Samples of the product streams were taken at half hour intervals thereafter until three samples had been obtained. Close agreement of the analysis of these samples indicated steady-state conditions had been reached.

Some difficulty was encountered in devising a scheme to analyze the four component solutions resulting from extraction. Chemical analysis was ruled out and the final procedure used involved the measurement of two of the physical properties of the multicomponent solutions. For this purpose an analysis diagram relating the viscosity and refractive index of the anhydrouse system ethanol-isopropanol-benzene to its composition was constructed.

Data were collected and evaluated which show that the efficiency of the extraction process may be varied to some extent by the addition of a wetting agent to one of the two phases present, thereby decreasing the interfacial tension between these two phases.

26. Capacity of Vertical Pipes Carrying Liquid in Countercurrent Flow.

Robert Thomson, Henry P. Voznick, and O. L. Updike, Jr.; *University of Virginia.*

Pressure drop and flooding velocities are being studied for the upward flow of gases countercurrent to a liquid film inside circular tubes. Two approaches have been taken, one depending on consideration of the frictional forces and velocity gradients within the film thickness for the

turbulently flowing liquid. This measurement has been carried out by several methods. The most satisfactory procedure has been trapping the film in the tube and measuring its volume. The dimensional analysis approach, though not too productive, has given an indication that surface tension has little effect on tube capacity. Modification of top and bottom ends of the tube to smooth the intake and discharge of liquid has increased tube capacity substantially by eliminating flooding at these points.

27. Calibration of a Five Inch Centrifugal Molecular Still.

G. J. Lombardi and F. W. Bull; *Virginia Polytechnic Institute.*

Distillations were performed on the experimental five inch centrifugal molecular still, and data were obtained for determining the elimination maxima of lauric, myristic, palmitic, and stearic acids. The effect of increasing chain length of the elimination maximum as determined by the experiment was compared with published information.

28. The Determination of the Extent of Thermal Cracking in a Bench Scale Fixed Bed Vertical Catalytic Cracking Unit.

T. M. Beamon and Fred W. Bull; *Virginia Polytechnic Institute.*

Data was obtained for the cracking of a light East Texas gas oil, thermally and catalytically, in a fixed bed, vertically mounted, one hundred milliliter capacity catalyst activity test unit. The unit was operated with an unpacked reactor, and then packed with cracked quartz, "Sovebeads," and Houdry catalysts 36D2-24Z and 36D2-25Z, at atmospheric pressure, 900 degrees fahrenheit, and a feed rate of 1.5 volumes of feed per volume of catalyst per hour. Standard procedures of catalyst regeneration and products analysis were used.

The amount of cracking taking place over and above that caused by the catalyst was reported as thermal cracking. This thermal cracking was determined in an attempt to correlate the reported catalyst activities by the Houdry CAT "A" activity test and of the catalyst activities obtained using this unit.

29. Heat Transfer to an Externally Heated, Fluidized Bed of a Commercial Bead Type Cracking Catalyst.

H. C. Breckon and Fred W. Bull; *Virginia Polytechnic Institute.*

In this investigation the heat transfer characteristics of a fluidized system were studied. The purpose was to evaluate the effect of superficial air velocity and temperature driving force on the local individual coefficient of heat transfer between a fluidized bed of "Sovabeads" and the inner surface of the externally heated, fluidized column, utilizing dry air at approximately 70°F.

Data was obtained under equilibrium conditions for several air velocities and bed wall temperatures and the local individual coefficients of heat transfer were calculated for each set of conditions. Plots were made showing effect of air velocity at constant wall temperature and effect of wall temperature at constant air velocity on the local individual coefficients of heat transfer. A temperature traverse of the bed during each run showed the effect of these two variables on the horizontal and vrtical bed temperature gradients.

30. Pilot Plant Distillation of Sea Water.

J. D. Cullen, D. C. Spence, J. T. Walmsley, and F. C. Vilbrandt; *Virginia Polytechnic Institute.*

Hampel of Armour Research Foundation developed a process whereby sea water is heated under pressure for a definite period of time, and then released to atmospheric pressure with aeration. This treatment removes the carbon dioxide evolved from the decomposition of carbon-

ates and bicarbonates and precipitates magnesium hydroxide. The precipitate is filtered out and the water neutralized by acidification.

A pilot plant for testing the above processing was constructed by the Coast Guard and the U. S. Navy at Fort Story, Va., and tests were made to determine the effectiveness of the process in preventing scale formation in sea water evaporators.

Results of the tests conducted on the equipment showed that decarbonation alone, and decarbonation and filtration of sea water increased, rather than decreased, scale formation. However, results from the use of the complete treatment process, decarbonation, filtration, and acidification, showed that, when compared to evaporators operated on unprocessed sea water, a reduction of more than 90 per cent in the quantity of scale formed was achieved.

31. Hypersorption Process for the Vapor-Phase Separation of Carbon Disulfide and Hydrogen Sulfide.

L. A. Caplan and Fred W. Bull; *Virginia Polytechnic Institute.*

Data were obtained for the vapor-phase separation of carbon disufide from hydrogen sulfide in a laboratory-scale hypersorption unit, operated at 15 pounds per square inch, absolute pressure, using Sova beads as the adsorbent. The feed vapor, approximately two to one mol ratio of hydrogen sulfide to carbon disulfide, entered the unit at 60°F. The adsorbent was reactivated in a heat exchanger using saturated steam at 30 pounds per square inch, absolute pressure; and then cooled in a heat exchanger using water at 60° F. Feed rates and adsorbent recycle rates were varied in an effort to determine the optimum operating conditions for the unit.

Correlation was attempted of the effects of varying feed rates and adsorbent recycle rates on the vapor separation.

32. A Variable Filter for Use with Doppler Radar Systems.

H. L. Beazell, Jr. and L. R. Quarles; *University of Virginia.*

A constant bandwidth bandpass filter has been developed that will automatically track the changing output frequency of a doppler radar velocimeter. Such a filter increases the range of the doppler system by improving the effective sensitivity of the receiver, and eliminates interfering frequencies from appearing on the recorded output.

33. Analogy Between Subsonic Compressible Fluid Mechanics and the Special Theory of Relativity.

R. W. Truitt and V. G. Szebehely; *North Carolina State College* and *Virginia Polytechnic Institute.*

One of the major problems in subsonic compressible flow is the reliable prediction of the pressure distribution over the surface of a body. This paper applies one of the results of the so-called Sound-Space Theory to this problem. The ability of this new theory to predict the pressure distribution with greater accuracy and simplicity than other existing methods is demonstrated by comparative plots against experimental data. In particular, the results of the Sound-Space Theory show a higher degree of accuracy in predicting the pressure distribution over the nose of the airfoil and especially over the entire lower surface. A step-by-step procedure for calculating the desired pressure distribution from low-speed experimental data is given along with an explanation of what constitutes low-speed data. The Sound-Space method of predicting pressure distributions is not valid over a surface where the local mach number is unity.

Minutes of the Section of Geology [8]

TILTON E. SHELBURNE, *Chairman*

CHARLES E. SEARS, JR., *Vice-Chairman*

WILLIAM M. MCGILL, *Secretary*

BYRON N. COOPER, *Section Editor* (1953)

FRIDAY, MAY 12 — 9:00 A. M. — PARLOR F

The Section of Geology met in Parlor F of the Hotel Roanoke on Friday, May 12, 1950. Two sessions were held: one from 9:00 a. m. to 12:30 noon, and the other from 2:10 to 4:30 p. m. Due to the unavoidable absence of Tilton E. Shelburne, Charles E. Sears, the vice-chairman, presided at both meetings. Despite the limited seating capacity and other discomforts of the room in which the meeting was held, 73 people attended the two sessions. Discussion of each paper added to the interest and success of the meeting. The following papers were presented:

1. Some Plans and Projects of the Virginia Geological Survey.[1]

   William M. McGill; *Virginia Geological Survey.*

An outline of the present and projected status, in personnel and projects, of the Virginia Geological Survey, with a brief discussion of plans for both (1) State and (2) cooperative investigations, and needs of the Survey to perform in an efficient and effective manner the duties and functions assigned that agency, and which it desires to perform.

2. Mineralogical Studies of the Sediments of Hardware River, Albemarle and Fluvanna Counties, Virginia.

   P. E. Forkgen, W. H. Hunt and R. R. McDonald; *Washington and Lee University.* (Presented by R. R. McDonald.) (Introduced by M. H. Stow.)

The purpose of this study was to determine if a correlation might be established between the Hardware River sediments and the bedrock of the area drained by this stream. The Hardware River, one of the minor tributaries to the James River in the western Piedmont, crosses metamorphic gneisses, schists, slates and quartzites, an igneous volcanic formation and a minor Triassic sedimentary group. The following minerals were found: zircon, magnetite, ilmenite, leucoxene, hornblende, actinolite, epidote, muscovite, biotite, garnet, hypersthene, tourmaline, staurolite, rutile and chlorite. While certain trends are noted in the mineralogical composition of the stream samples and may justify a partial correlation between the sediments and the parent rock, it is difficult to establish a complete correlation because there do not appear to be sufficient differences between the mineral suites of several of the bedrock formations to reflect perceptible trends in the occurrence of minerals in the alluvial samples.

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1 Published with the permission of the State Geologist of Virginia.

3. Mineralogical Studies of the Sediments of Partridge Run, Amherst County, Virginia.

C. C. Humphries, R. W. Hynson and R. E. Whitson; *Washington and Lee University*. (Presented by R. W. Hynson.) (Introduced by M. H. Stow.)

Fourteen samples of stream sand were collected from Partridge Run and its tributaries about eight miles each of Lynchburg. These samples represent sediment derived from each rock type across which the streams flow. The main stream flows in a southeasterly direction and joins the James River at Stapleton Station. Pre-Cambrian gneisses, schists, soapstone, greenstone flows, marble, quartzite, and one diabase dike of Triassic age near the mouth of the stream, comprise the bedrock of the area drained by the streams under consideration. The spot samples were prepared for microscopic study by the standard procedure of sedimentary petrography.

From the metamorphic and igneous bedrock the following heavy minerals were derived: zircon, rutile, ilmenite, magnetite, leucoxene, muscovite, amphiboles, epidote, garnet, tourmaline, biotite, kyanite, olivine, staurolite, and chlorite.

The study of the sands of Partridge Run and its tributaries demonstrates that recent stream sands reflect the petrography of the provenance from which the sediment is derived.

4. The Geology and Petrography of Metapyroxenites in Virginia.[1]

Arthur A. Pegau; *Virginia Geological Survey*.

An understanding of the geology and petrography of the rock type known as metapyroxenite should be very helpful in a better comprehension of the commercial varieties known as soapstone (Alberene stone) and Virginia Greenstone.

The name "metapyroxenite" means metomorphosed pyroxenite. Pyroxenite, in turn, is the general term applied to those coarse-grained igneous rocks composed of varying species and proportions of pyroxenes, amphiboles and biotite. These are all dark-colored, femic or mafic minerals. Pyroxenites contain little or no quartz and feldspar (salic or felsic minerals). When olivine is present the rock is known as peridotite, and its metamorphic equivalent, metaperiodotite. Metapyroxenite accurs as dikes (tabular igneous bodies) that have lengths ranging from 100 feet to 10 or more miles and widths of 10 to 2,500 feet. Metapyroxenite occurs in practically all of the counties in the Piedmont province of the State in areas underlain by metamorphic rocks such as schists and gneisses.

Metapyroxenite is a medium-grained, apple-green to dark-green, schistose rock, which often has a mottled appearance, resulting from partially weathered grains of magnetite. The rock is composed essentially of green chlorite, dark-green to black amphiboles with minor but consistent amounts of magnetite. The variety designated "soapstone" always contains talc and usually contains serpentine. The variety termed "Virginia Greenstone" is made up of chlorite and the non-aliminous green amphibole, actinolite, and to a less extent, the white amphibole, tremolite.

1 Published with the permission of the State Geologist of Virginia.

5. A Petrographic Study of a Dikeline Structure Occurring at McCormick Overlook on the Skyline Drive, Augusta County, Virginia.

Buster W. Miller and Robert S. Young; *University of Virginia.* (Introduced by Wilbur A. Nelson.)

The structure here discussed is located 3.4 miles north of Rockfish Gap on the Skyline Drive in Augusta County, Virginia. The filling of associated fractures with the same material, jointing normal to the walls of the structure, and other field relations afford evidence for calling the feature a dike. Sedimentary texture, unbaked or unsoaked borders, rounded quartz grains, proximity to other sedimentary beds, and included rock fragments, all of which are clearly present, give conclusive evidence of a sedimentary origin.

Two possibilities are offered as to the explanation of this structure: (A) the material was forced into its present position while mobile, or (B) the feature represents a lensing-out phase of a relatively thin sedimentary bed in which metamorphism has obliterated all traces of bedding.

The minerals identified by petrographic study are: quartz, epidote (variety pistacite), feldspars (orthoclase and albite), pyrite, and apatite.

6. Occurrence and Origin of Limonite and Malachite in Montgomery County, Virginia.

Charles E. Sears; *Virginia Polytechnic Institute.*

Limonite and Malachite occur in autobrecciated dolomitic zones of the Rome formation. The iron and copper was originally in the form of sulphides and under the processes of weathering has been changed into oxides and carbonates. The limonite was mined in the early days of the Iron Industry in Virginia.

7. Stratigraphic and Structural Control of Zinc Deposits in The Timberville Area, Virginia.

Jack Green and Frank G. Lesure; *Virginia Polytechnic Institute.* (Introduced by Rhesa M. Allen.)

The occurrence of two sphalerite-bearing, northeast-trending zones of brecciated dolomite some five miles northwest of New Market, Virginia, in the upper Beekmantown formation raises some interesting questions of structural and stratigraphic control. The zinc ore occurs in a belt on the northwest and southeast limbs of a syncline with the synclinal limbs separated by a reverse fault. The localization of mineralization in each belt to a common structural and stratigraphic relationship is discussed.

8. The Use of Geology in Forest Management in the Jefferson National Forest, Virginia.

Paul W. Sundheimer; *Forester, U.S. Forest Service, Jefferson National Forest.* (Introduced by William M. McGill.)

The management of forests requires some understanding of the soil. The soil mantle is a contributing factor in the determination of plant association and behavior of individual species occupying it. Parent material has a profound influence on the physical and chemical makeup of the soil. In localized areas it can be the determining factor.

The complex geological structure of the Appalachian Valley province presents wide extremes in parent material within short distances. Observations in Southwest Virginia indicate certain consistencies in the

occurrence or associations of tree species and growth behavior of individual species in relation to underlying rock formations. A study or knowledge of regional geology has been a useful tool, in an extensive sense, in attempts to classify the potential of forest lands and rate the behavior of species. It has also given insight to water relations.

9. Geologic Construction Materials in Albemarle County, Virginia.

William T. Parrott; *Virginia Department of Highways.*

The field of Economic Geology has, in the past, given very little attention to the materials used in highway construction. Now that highway engineers are demanding as never before more rigid specifications for materials, the geologic construction materials of Albemarle County have been mapped, tested and their use in the field of highway engineering discussed.

It has been determined by tests that the best highway aggregates in Albemarle are greenstone, granodiorite, granite, granite gneiss, and Triassic conglomerate. The poorest aggregates are the phyllites, schists, slates, shales, and sandstones. Whereas none of the aggregates will meet the specifications of limestones and dolomites, the laws of economics demand that the rocks mentioned be used locally and for the most part they conform to required specifications.

10. Mechanical and Chemical Loads of Some Virginia Streams.

Rhesa M. Allen, Jr.; *Virginia Polytechnic Institute.*

A synthesis of available data on the dissolved load and suspended load of several Virginia streams indicates in some measure the degree of erosion taking place at the present time. An attempt is made to determine quantity of bed load from available data on suspended load. Application of these data to dam and reservoir usefulness is noted.

11. Coefficients of Transmissibility and Storage Determined for Potomac Sands in the Franklin Area, Virginia.[1]

Allen Sinnott; *Geologist, U.S. Geological Survey.*

Drawdown and recovery measurements on observation wells near large-yield municipal and industrial wells in Franklin have recently been made, from which the permeability—in the form of the coefficient of transmissibility—and the coefficient of storage have been computed. From these coefficients, additional computations can be made to estimate the drawdown which would take place at any time and at any distance from the pumped wells, provided the yield of the wells is known. Likewise, the drawdown to be expected by the addition of other large-yield wells can be estimated. Examples are given.

12. Upper Cretaceous Beds in the Coastal Plain of Virginia.[1]

D. J. Cederstrom; *U.S. Geological Survey, Charlottesville.*

Conclusion, voiced at the 1947 meeting, regarding Upper Cretaceous beds of the Virginia Coastal Plain are confirmed. Detailed study of foraminifera throughout the Virginia Coastal Plain shows that beds older than those of Wilcox age are characterized generally by mottled clays and are varyingly fossiliferous. The writer believes the microfossils are of dominantly Upper Cretaceous aspect, but some Paleocene aspects are recognized.

The assemblage found at Washington's birthplace in Westmoreland County ranges from 269 to 345 feet below the surface. Adjacent to Ches-

1 Published with the permission of the Director of the United States Geological Survey and the State Geologist of Virginia

apeake Bay the fauna is similar but has certain elements which suggest deeper-water conditions. These facies have been traced southward through Port Royal, Tappahannock, Cumberland Landing, West Point, Camp Peary, Charles City, and Jamestown to the Suffolk-Franklin area south of James River, where the presence of Upper Cretaceous strata has been established through study of all fossils. The assemblage found at Washington's birthplace appears to be well represented in southern Maryland in strata that have been called Paleocene. There the assemblage seems to be identical to that at Washington's Birthplace, except for the presence in Maryland of an abundance of a large new species of *Robulus*.

More specific statements may possibly be made after these faunal assemblages have received detailed paleontological study.

13. A Possible Explanation of Normal Beds Bounded by Overturned Beds in the Unicoi Formation on the Northwest Flank of the Blue Ridge on U.S. Route 250, Virginia.

Horace B. Cooke, II; *University of Virginia.* (Introduced by Wilbur A. Nelson.)

The area described in this report is on the west flank of the Blue Ridge Mountains along U.S. Route 250. The section was studied by the Structural Geology class of the University of Virginia in 1949.

Study of the Unicoi Formation in this area presented the problem of explaining a set of beds in normal sequence bounded by beds, in the same formation, in overturned sequence. There seemed to be no obvious solution to the problem.

Comparison of the studied area with the Roan Mountain area in North Carolina and Tennessee, described by Arthur Keith, showed similar structural conditions in both areas. The Roan Mountain area has normal beds of the Unicoi formation thrust over overturned beds and filling hollows in them. Erosion has exposed the contact of the two. The explanation of the Roan Mountain area is that low-angle faults have thrust the Unicoi over the overturned beds. The structural conditions in the Virginia section could be explained by this type of structure.

It can be logically assumed that since the Roan Mountain region and the studied section are closely related, they could also have the same type of faulting.

14. Geologic Aspects of Engineering Soil Reconnaissance.

Lowell E. Gregg, (Presented by James Young, Jr.); *Associate Director of Research, Kentucky Highway Department.* (Introduced by Tilton E. Shelburne.)

Considering its abundance, there is probably less fundamental knowledge of soil than any of the other engineering materials. Until the past few years, practically all interest in the engineering use of soil was placed only in the mechanics of the material—its reactions to different types of forces. Progress in determining mechanical properties and establishing solutions to problems of mechanics was rapid, but mounting costs of soil testing and limited knowledge of the extent to which the test data could be applied focused attention on some evaluation of soil in place.

Because it is wholly a product of nature, soil should be studied first from the standpoint of its formation. Classification starts in the same way, for many of the general properties of different types of soil are determined by the way in which they were formed. Past developments by geologists and soil scientists, the latter directing their efforts mainly to agricultural requirements, formed a foundation upon which the prin-

ciples of engineering soil reconnaissance could be built. Techniques and equipment developed primarily for geologic investigations are being adapted to soil reconnaissance with increasing success.

15. Strip Map of Engineering Materials Along State Route 7, Loudoun County, Virginia.

J. C. Stevens; *Virginia Council of Highway Investigations and Research.* (Introduced by Tilton E. Shelburne.)

During the summer of 1949, the Virginia Department of Highways planned the relocation of a five-mile section along State Route 7, extending easterly from Leesburg, Loudoun County. Subgrade soils along this relocation consist mostly of plastic clays derived from weathered Triassic shales. These soils, which have high moisture content, lack stability and lose strength during wet periods. Since pavements must be built to sustain heavy loads during average weather conditions, low supporting strength of the soils are a governing factor.

In order to design against the unsatisfactory soil conditions, better soils must be "borrowed" for the construction of a sub-base. Relative strength characteristics of the soils are indicated by Californai Bearing Ratio test. Search for a satisfactory "borrow material" was conducted in the field by several persons, with the aid of a geologic map. This method required searching for materials over an area of 120 square miles.

A simpler field solution was established last fall. It was found that soil areas most suitable from the standpoint of textural qualities and accessibility could be spotted quickly on air photos. Under this procedure, soil sampling can be done without much field reconnaissance. This procedure might effect material reductions in cost of preliminary work of highway construction.

16. Significance of Hayter Fans in the Geomorphic History of the Appalachian Ridges of Western Virginia.

Byron N. Cooper; *Virginia Polytechnic Institute.*

For generations, the even-crested ridges of the Appalachian Mountains have been cited as evidences of preexisting erosion levels, some of which have been called peneplains. Detailed study of many Appalachian ridges discloses features which prove beyond any reasonable doubt that the observed evencrestedness and general accordance of summit elevations, as seen today, are the products of a cycle of erosion still in progress, and that they are not the products of ancient cycles of regional reduction, as generally believed. The basic concepts of geomorphic evolution of the Appalachian region are examined and evaluated in the light of evidence presented.

17. A Revision of the Structure and Stratigraphy of the Blue Ridge and Piedmont Area in Albemarle County, Virginia.

Wilbur A. Nelson, *University of Virginia.*

18. Oil and Gas Possibilities in the Bergton District, Rockingham County, Virginia.[1]

Wilbur T. Harnsberger; *Virginia Geological Survey.*

Presented in this paper is a brief account of the results of a preliminary study of the stratigraphy and structural conditions, particularly with regard to oil and gas possibilities, in the Bergton district in the northwestern part of Rockingham County, Virginia. The area investi-

[1] Published with the permission of the State Geologist of Virginia.

gated is in the Valley Ridges section of the Appalachian Valley and Ridge province and lies between Little North Mountain on the southeast and Shenandoah Mountain on the northwest.

Involved are formations ranging from the Martinsburg of middle Upper Ordovician age to and including the Hampshire of Upper Devonian age. The major structures described are the Adams Run anticline and the Crab Run anticline which extend northeastward into Hardy County, West Virginia. Both of these structures plunge to the southwest and terminate in the district here discussed. Three test wells have been drilled in this district. Shows of gas have been reported in two of these wells.

19. An Unidentified Mineral from the Vicinity of Timberville, Rockingham County, Virginia.

Marcellus H. Stow and Wilmer F. Stickle; *Washington and Lee University.* (Presented by M. H. Stow.)

On January 8, 1950, the junior author found small crystals of a lemon-yellow mineral adhering to fragments of Beekmantown limestone that had been removed during zinc mining operations at a small prospect 4 miles northeast of Timberville, Rockingham County, Virginia.

In the laboratory, the senior author made determinations of the principal optical properties of the crystals, but with the data available was unable to identify the material.

Crystals were mounted in Canada balsam and these slides, along with crystals on the limestone, were sent to Miss Jewell J. Glass of the Section of Geochemistry and Petrology, U.S. Geological Survey.

The following physical and optical properties were reporter by Miss Glass:

Shape: Aggregates of tiny prismatic crystals
Color: Lemon Yellow
Cleavage: good, parallel to elongation
Pleochroism: faint, if any

Indices: $\begin{cases} \alpha = 1.532 \\ \beta = 1.940 \pm .003 \\ r = 1.943 \pm .003 \end{cases}$

Birefringement: 0.411
Optical character: Negative
Extinction: parallel
Elongation: Negative

Orientation: $\begin{cases} a = x \\ b = y \\ c = z \end{cases}$

Optic angle: 2V = small
Dispersion: $r > v$, extreme
Crystal system: approx. Orthorhombic
Abnormal interference colors

In her report, Miss Glass states, "The optical properties do not agree with anything in Larsen's Tables."

In addition to determining the above optical properties, Miss Glass obtained an informal report on a spectrographic anaylsis and an x-ray examination.

The spectrographic report reads:
Major elements: Al, Mg, Si, Ca, Fe,
Minor elements: Mn, Ti.
Not Found: Cd, Zn, Cu, Mo, Pb, Ag, As, Sb, Sn, Cr, V, Tl, Ge, Be, B, Mo, La, Y, Sr, Ba, P.

Owing to the small size of the sample, the spectrum is weak. Small amounts of the elements reported "not found" may have escaped detection.

The report on the x-ray examination reads, "Prismatic crystals were x-rayed (film 5024). The powder pattern is not in the files."

Hence, to date, this material is unidentified.

20. Geology of Fredericksburg and Vicinity, Virginia.

James R. Burns; *University of Virginia.*

This paper is based on a thesis prepared under the direction of Dr. Joseph K. Roberts, Professor of Geology at the University of Virginia.

The area lies in parts of the Piedmont and Coastal Plain. The oldest rock of the Piedmont is quartz-mica schist, and it is intruded by quartz-diorite gneiss; both are of pre-Cambrian age. The Fredericksburg granite, probably of late Paleozoic age, intrudes the gneiss in several areas. Coastal Plain formations include the lower Cretaceous Patuxent formation, the Eocene Aquia and Nanjemoy formations, and five Plio-Pleistocene terrace formations: Brandywine, Coharie, Sunderland, Wicomico, and Chowan.

Mineral resources include sand and gravel, building stones (granite and sandstone), glauconite marl, clay, and ground water.

21. The Chepultepec in Virginia.

R. S. Edmundson; *University of Virginia.*

The Chepultepec formation (basal Ordovician), consisting of about 50 to 500 feet of limestone with intercalated beds of magnesian limestone and dolomite and a sparse but characteristic fauna of primitive cephalopods, gastropods, and brachiopods, has been identified at many localities along the southeast side of the "Valley" between Washington and Frederick counties. The possible occurrence of Chepultepec, west of the Greendale syncline, is suggested by specimens of diagnostic cephalopods at a few localities in Scott County, including Natural Tunnel.

The Chepultepec is one of the best marked zones in the "Great Valley", since it is commonly a valley-making band between low ridges underlain by sandstones in the Conococheague limestone or Copper Ridge dolomite and rounded hills underlain by cherty zones in the Beekmantown formation .

22. Geology of the Shenandoah Valley of Virginia.

Betty Campbell Cook; *Honorable Mention, National Science Talent Search, Wilson Memorial High School, Staunton.*

BUSINESS MEETING

Following the discussion of the last paper, several announcements were made and a brief business session held, at which matters of interest to the Section were discussed. Upon recommendation of the nominating committee the following officers were elected for the next year: Allen Sinott, Chairman; William H. Brown, Vice-Chairman; and W. Tom Parrott, Secretary. Dr. Byron N. Cooper was reelected as the representative of the Section on the Editorial Board of the Virginia Journal of Science. The meeting was adjourned at 4:30 p. m.

FIELD TRIP — MAY 13, 1950 — 8:30 A. M.

On Saturday morning, May 13, some 34 members and guests assembled in front of the Hotel Roanoke and left promptly at 8:30 a. m. in automobiles on a field trip under the leadership of B. N. Cooper,

assisted by William M. McGill. A City Police escort within the city and a State Trooper escort for the entire trip greatly facilitated the orderly movement of the automobiles and added to the safety and success of the field trip.

The total length of the trip was 45 miles. Included were ten stops to examine and collect samples from some excellent exposures in the southern Appalachian Valley.

Among the most interesting stops were those to the new cuts in sandstones, limestones and shales of Ordovician Age along the Cloverdale and Catawba railroad on the south limb of a syncline which forms the southeast "elbow" of Tinker Mountain; exposures of the Fincastle Conglomerate in the Liberty Hall black shale near Fincastle; old quarries and mines near Eagle Rock, which provided an interesting study in structure interpretation; and the Iron Gate Arch of Silurian sandstones. The group disbanded at Iron Gate at about 3:00 p. m.

Minutes of the Section of Medical Sciences [9]

WILLIAM BICKERS, *Chairman*

ERLING S. HEGRE, *Secretary*

WILLIAM BICKERS, *Section Editor* (1953)

FRIDAY, MAY 12 — 9:30 A. M. — PARLOR D

1. The Effects of Mercurial Compounds on Invertase.

C. L. Gemmill and E. M. Bowman; *University of Virginia Medical School.*

Mercuric chloride, merbromin, thiomerin and mercurin are strong inhibitors of invertase. The inhibition produced by mercuric chloride is competitive. The inhibition of invertase by mercuric chloride may be reversed by 2,3-dimercapto-propanol. Invertase may be added to the list of enzymes which may be inactivated by mercurials and reactivated by 2,3-dimercapto-propanol. This enzyme has the novel property of having the mercuric chloride inhibition augmented by cysteine and glutathione.

2. Thermodynamics of Saccharase Activity.

F. C. Holler; *University of Virginia Medical School.*

Thermistors, which have a sensitivity of about 10 times that of Beckman thermometers, have been used in a calorimeter designed for thermochemical and kinetic studies of enzyme reactions. The calorimeters were mounted in a water bath constant to ± .001°C. The calorimeter plus contents was calibrated for heat capacity and thermal flow effects by passing a known amount of current for a known period of time through a resistance mounted in the calorimeter. A special constant-current electronic circuit was constructed for this purpose. The inversion of sucrose, dissolved in an acetate buffer, by the action of invertase was carried out at 29.5°C. The temperature changes were observed over a period of 2 hours, the reaction being stopped by neutralizing the acetic acid. Analysis of the resulting solution gave the quantity of sucrose that had reacted. The heat of reaction was taken to be equal to the electrical energy supplied to the heater in the calibration run. A representative run showed this to be -15, 264 joules per mole at this temperature. This agrees very well with Sturtevant's value (*J. Am. Chem. Soc.*, *59*: 1528, 1937) for the inversion of sucrose by the action of HCl. Summarizing, this work shows that thermistors can be successfully used in determining the heat production of enzymatic reactions.

3. Some Effects of the Insecticide Ryanodine on Frog Tissues.

Marie-Louise Flinker, Robert W. Ramsey and Leslie E. Edwards; *Medical College of Virginia.*

Some of the effects of the insecticide ryanodine were studied in the intact frog and various frog tissues. Injection of the alkaloid into the dorsal lymph sac of intact frogs resulted in rigor in 3-4 hours. An increase in oxygen consumption was noted in Warburg studies on frog sartorii, stomach mucosa, liver and heart tissue. Frog sartorii were examined microscopically after exposure to ryanodine and occasional structural changes noted. The contracture occasionally seen in the sartorii after contact with ryanodine did not appear to be correlated with the oxygen uptake.*

* The above work was done under contract between the Medical College of Virginia and the Office of Naval Research.

4. Action of Enzyme Inhibitors on the Increased Oxygen Uptake of Skeletal Muscle Produced by Ryanodine.

Leslie E. Edwards and Marie-Louise Flinker; *Medical College of Virginia.*

Frog sartorii were dissected out and equilibrated at 4°C. in phosphate buffered Ringer's solution for 24 hours. Respiration studies were carried out using the Warburg apparatus. Two muscles were used per flask. It has been found that the insecticide ryanodine increases the oxygen uptake of skeletal muscle 20 to 30 fold when compared with the oxygen uptake of the resting muscle. In order to clarify the mechanism behind the increase in oxygen uptake caused by ryanodine the effects of some enzyme inhibitors on this phenomenon were investigated.

The following enzyme inhibitors were studied: sodium azide (.002 M) and sodium iodoacetate (0.1 M). In addition, methylene blue was added to sodium azide to note if recovery would occur.

Both enzyme inhibitors blocked the action of ryanodine. Methylene blue did not increase the oxygen uptake once it had been blocked by sodium azide. It was also found that methylene blue, when given before ryanodine, would block the oxygen uptake produced by ryanodine.*

5. Clinical Experience with the Quick Prothrombin Consumption Test, using Only 2 Tubes.

K. T. Menk, M.D. and O. B. Bobbitt, M.D.; *University of Virginia Medical School.*

Two cc. of blood is put in each of two Wassermann tubes, with as little agitation as possible, and kept warm in the hand until placed in the 37°C. water bath. Fifteen minutes after clotting, sodium citrate is added to one tube to stop prothrombin conversion, the clots are gently rimmed, both tubes are centrifuged at 2500 RPM for one minute, the sera removed to two other tubes and returned to the water bath. The prothrombin activity is determined on both sera immediately and three more times at 15 minute intervals.

Over fifty tests were done on normals, hypoprothrombinemias (including those due to congenital AC globulin deficiency, dicumarol poisoning, vitamin K deficiency, liver disease), thrombocytopenic states (primary and secondary, both before and after splenectomy), and hemophiliacs. The test was consistent in the hemophiliacs, inconsistent in the thrombocytopenic states (contrary to Dr. Quick's experience) and of no help in the other diseases.

Conclusion: Any laboratory using Dr. Quick's standard prothrombin time test can, by the use of three additional and easily prepared reagents, do the prothrombin consumption test which appears to be of great value in proving a diagnosis of hemophilia.

6. Studies on the Process of Phosphate Uptake by Human Erythrocytes.

D. R. H. Gourley; *University of Virginia Medical School.*

Radioactive phosphorus (P^{32}) has been used to study the uptake of phosphate ions by human erythrocytes *in vitro*. It seems certain that the transfer of phosphate ions from the plasma into the cells is chemical in nature and at least partially under enzymatic control. For example, the difference in the rate of uptake of P^{32} over a relatively small absolute temperature range is too great for a process of simple physical diffusion. At 37°C. approximately 50% of the added P^{32} has been taken up by the

* The above work was done under contract between the Medical College of Virginia and the Office of Naval Research.

erythrocytes within 100 minutes. However, at 15°C. no measurable amount of P^{32} leaves the plasma in this interval. The data obtained at nine temperatures ranging from 15°-40°C. conform to the Arrhenius expression relating the transfer velocity to temperature. From the Arrhenius equation the activation energy, μ, has been calculated to be 16,700 calories. Furthermore, other things being equal, lowering the blood glucose level reduces the amount of P^{32} which enters the cells in a given period. The P^{32} uptake can be returned to normal simply by raising the concentration of blood glucose to its normal level. Finally, the addition of a metabolic inhibitor, iodoacetic acid, drastically reduces the rate at which phosphate ions are taken up by the cells. It is difficult to see how simple diffusion of phosphate could be so markedly influenced by the low concentrations of this compound which are effective.

7. Forensic Serology.

Robert K. Waller; *Office of the Chief Medical Examiner, Richmond.*

Three main divisions of applied serology will be discussed:

1. The identification of human protein, its distinction from animal proteins and application of this procedure.
2. Identification of blood group specific substances A and B in blood stains, saliva and seminal stains. Application of this technique.
3. Use of blood groups, subgroups, M and N and Rh factors in cases of disputed paternity (maternity) or interchange of children.

8. Active Sodium and Chloride Uptake by Surviving Frog Skin.

Joyce Parrish and Ernst G. Huf; *Medical College of Virginia.*

The net uptake of Cl^-, Na^+, H_2O from Ringer solution (R.) by the surviving frog skin has been studied using skin bags. The bags (epithelium inside) were filled with 5 ml. of R. and immersed for 12 hrs. in 2.5l of R. of the same concentration. Cl^+ and Na^- were determined iodometrically and flame photometrically respectively. After 12 hrs. amount and ion concentration of the fluid in the bag had diminished. The changes were dependent on: salt concentration, pH, temperature of the R. The net uptake of ions and H_2O from 0.4 R. (48×10^{-3} millieq. Cl^- or Na^+/ml.) was only slightly less than the uptake from 1.0 R. (120×10^{-3} millieq./ml.). The Cl^- and Na^+ gradients across the skin after 12 hrs. were higher in experiements with 0.4 R. than in experiments with 1.0 R. Acid reaction of the R. or lowering its temperature (3°) decreased the net uptake of ions and H_2O from 0.4 and 1.0 R. In the majority of experiments more Na^+ than Cl^- was absorbed by the epithelium. The apparent Cl^- excess (Na^+ deficit) in the bag increased with increasing temperature. The solution touching the epithelium became more acid than the solution touching the chorion side of the skin. It can be calculated from Qo_2 that enough acid metabolites are produced to combine with the apparently unbalanced amounts of Na^+ taken out from and of Cl^- left over in the solution in the bag.

9. Chloride in Skeletal Muscle.

Ernst Fischer, Helen V. Skowlund, Kathleen R. Royster, Dorothy M. Whitaker, Eleanor A. White; *Medical College of Virginia.*

We found evidence that with the procedure used by Heilbrunn and Hamilton (1942) not only Cl but also an unknown substance contained in the muscle space is precipitated as an Ag salt. This unknown material contains N, is destroyed by concentrated HNO_3 in the cold, and its Ag salt does not darken when exposed to light. The unknown is not cyanide. Shenk (1950) found with the Parr bomb method Cl values more

than twice the values found with the original Van Slyke method. We were not able to confirm Shenk's findings. For mammalian as well as for frog muscles, our Parr bomb determinations gave us inside the errors of the methods the same value as with an improved Van Slyke method.

The electrolyte distribution in left and right identical muscles shows little difference, but the Cl content of different anatomical muscles of the same animal might vary nearly 100%, while the K and Na content might differ 7% and 60%, respectively. However, if one calculates for these different muscles the K and Na concentration existing inside the muscle fibers, correcting for fat content and assuming that Cl is restricted in normal muscle to the tissue space only, rather uniform K and Na values are found.

10. Histopathologic Studies of Abnormal Enamel Formation in Human Teeth.

S. J. Kreshover; *School of Dentistry, Medical College of Virginia.*

Abnormalities of tooth formation have been observed in a series of infants and human fetuses. These lesions permit the tracing of a sequence in the pathogenesis of enamel hypoplasia from its earliest manifestations to the end result of clinically demonstrable defects.

It seems apparent that abnormal enamel formation is nonspecific in nature and cannot, in the presented material, be definitely associated with a particular disease process or injury. That a variety of disturbances may be the causative agent in such abnormalities is accepted. Any of these, dependent upon their severity and the degree of cell injury, may result in the so-called hypoplastic enamel defects.

11. Motion Pictures of Cell Reactions to Implants of Tantalum in Tadpoles.

Carl C. Speidel; *University of Virginia.*[1]

Tantalum in the form of powder or wire may be readily implanted in the tadpole's tail and the behavior of the cells in the vicinity watched and photographed. Motion pictures have been obtained which portray the chief changes induced by the implanted material over periods from 5 hours to 80 days. Many of the scenes were photographed at low speed and show all cell movements greatly accelerated. In the case of powder implants, these include 1) the early congregation of leukocytes about the implant, 2) the ingestion of powder particles by leukocytes, endothelial cells, and fibroblasts 3) the formation and elimination of cutaneous papillae, 4) the migration of tantalum-laden leukocytes, and 5) the frequent encapsulation of a sizable portion of the implant. In the case of wire implants, leukocytes quickly surround the implant and wall it off from the surrounding tissues. Little inflammation is noticeable. In later states the leukocyte envelope appears to become syncytial in nature.

12. A Million Volt Berryllium Window X Ray Tube.

Fred Schmidt; *Medical College of Virginia.*

13. New Way of Determining X Ray Burns in Skin.

James Brooks, Paul Robinett and Everett I. Evans; *Medical College of Virginia.*

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1 Aided by a grant from the American Cancer Society (Committee on Growth). The tantalum was supplied by the Ethicon Suture Laboratories, New Brunswick, N. J.

14. A Polarographic Method for the Analysis of Tincture of Digitalis.

James G. Hilton; *University of Virginia.*

A method for the analysis of tincture of digitalis has been developed based upon the combined solubility and polarographic characteristics of the major cardiac glycosides, digitoxin and gitoxin. This method was developed by studying the polarographic break versus concentration curves for each drug. After this standardization, the separation of the drugs from the complex tincture was accomplished by a combination of extraction with petroleum ether and precipitation in 0.85 per cent saline solution. The results of this work showed that digitoxin and gitoxin could be separated from the tincture and from each other and analyzed as individual components. Analyses run on prepared tinctures and fortified tintures showed a reasonable degree in accuracy.

15. The Effects of Intravenous Injections of a Nitrogen Mustard on the Testes of Albino Rats.

James E. Kindred; *University of Virginia.*

The intravenous injection of the hydrochloride of tris (beta-chloroethyl) amine in sublethal amounts into adult albino rats has been found to produce histo-pathologic changes in the seminiferous tubules of the testes. Not all rats were affected to the same degree, but lesions appeared one day after poisoning. The tubule degeneration reached its greatest extent on the third day after injection, and injured tubules may persist after this period. Further degeneration does not occur. The greatest visible effect of the agent was on the spermatids, and caused cell fusion and giant cell formation with subsequent degeneration. Cell fusion was also observed in spermatozoa and spermocytes, but not in spermogonia. Qualitative study has shown hyaline degeneration of all types of germ cells with pycnosis or karyolysis of the nuclei. Spermocytes in division have been arrested by disruption of the spindle with consequent scattering of the chromosomes throughout the cytoplasm of the injured cells. Cells may be held in any of the stages of division and undergo degeneration with gradual fading of the chromosomes and increasing density of the cytoplasm. Quantitative study of the distribution of the cells in the tubules showed significant decreases in all types of germ cells and in the numbers in division in the animals with extensive and moderate lesions.

16. Mass Spectrometry in Physical and Biological Research.

Ray Williams; *Medical College of Virginia.*

17. Red Cell Volume in Burn Dogs Measured by Radioactive Phosphorus and T-1824 Dye.

Arnold Salzberg and Everrett Evans; *Medical College of Virginia.*

18. Hormonal Control of the Reproductive Cycle of Ovoviviparous Snakes as Related to the Evolution of Viviparity.

Douglas E. Bragdon; *University of Virginia.* (Introduced by J. E. Kindred.)

In the oviparous reproductive cycle, follicle maturation and ovulation, the equivalent of the follicular phase of the mammalian estrus or menstrual cycle, are under the control of pituitary FSH and LH, which stimulate estrogen secretion by the ovary. In the primitive mammals, the female reproductive tract is maintained during the short gestation period of 12-14 days by progesterone secreted by the corpus luteum

under the stimulation of pituitary luteotrophin. In the higher mammals, the prolonged gestation period is sustained by placental hormones.

To determine if the corpora lutea of live-bearing reptiles are functional in maintaining gestation, castration and hypophysectomy experiments were carried out on pregnant garter snakes (Thamnophis) and water snakes (Natrix). In snakes ovariectomized during the middle quarters of gestation and in snakes hypophysectomized at all stages of pregnancy, young continued to develop to term. There was, however, interference with the birth mechanism. Hypophysectomy performed prior to ovulation did not appear to modify the capacity of granulosa cells to ingest yolk during follicular atresia. Since the ovaries and hypophysis are not essential for normal development of the embryos, it seems, from the standpoint of evolution, that the morphological appearance of corpora lutea antedated their utilization as endocrine organs.

19. Effect of Alcohol Administration on Liver Fat, Heart and Liver Glycogen in the Rat.

J. C. Forbes and G. M. Duncan; *Medical College of Virginia.**

Rats on a diet low in lipotropic substances for approximately 1 to 6 months and receiving 10 per cent alcohol, by volume, in their drinking water showed the same general level of neutral fat and cholesterol in their livers as corresponding animals receiving water to drink. Both groups showed normal liver glycogen levels. The heart glycogen levels were distinctly below normal in all of these animals with fatty livers irrespective of whether they received alcohol or not. The reason for this is unknown. Acute alcoholic intoxication in normal rats reduced liver glycogen but did not lower glycogen content of the heart.

20. Pulmonary Toxicity of Wetting Agents Dispensed in Aerosols.

Glenn C. Hall, Jr.,; *University of Virginia Medical School.*

The effects of several well known wetting agents upon the respiratory tract of Guinea pigs was investigated. The agents were dispensed in conventional aerosol chambers. It was noted that these agents were toxic in proportion to their concentration. The toxic effects were determined by histological examination. The toxicity was manifested by extensive degeneration and desquamation of alveolar epithelium and invasion of alveolar spaces by macrophages with subsequent proliferation of alveolar epithelium and fibroblasts. In 0.1% concentration the agents are apparently non-toxic in guinea pigs. From this study it would seem advisable to limit the concentration of these agents to 0.1% in experimental investigation in man.

21. The Effect of Methanol, Formaldehyde and Formic Acid on Respiratory Enzyme Systems.

Daniel T. Watts; *University of Virginia Medical School.*

There is some evidence that methanol poisoning is due to the direct cellular toxicity of methanol or its oxidation products, formaldehyde or formic acid, rather than to the acidosis produced by the accumulation of formic acid. In the present experiments conventional Warburg manometric methods have been used to determine the effect of methanol, formaldehyde and formic acid over a range of concentrations on several enzyme systems, necessary for the metabolism of carbohydrates. At a concentration of 0.005 M, formaldehyde inhibited the enzyme systems investigated as follows: Respiration of yeast in glucose 68%; fermentation of yeast in glucose 68%; respiration of rat liver slices 39%; oxidation

* This work is a part of an investigation which is being carried on under the Division of Alcohol Studies and Rehabilitation, Department of Health, Commonwealth of Virginia.

of succinate by rat brain homogenate 72%; oxidation of ascorbate by rat brain homogenate 29%. In contrast to this inhibition by formaldehyde, methanol and formic acid produced no inhibition at concentrations lower than 0.5-0.25 M. Thus from the standpoint of enzymatic inhibition it would appear that formaldehyde rather than methanol or formic acid is the toxic agent in methanol poisoning.

22. The Site of Action of Strychnine in Facilitating Pressor Responses Evoked from the Cerebral Cortex.

E. C. Hoff, H. G. Langford, J. W. Vester, W. W. Beckner, and P. R. Thomas; *Medical College of Virginia.*

Investigations have permitted the delineation of certain areas of the frontal lobes of the cat's brain, stimulation of which results in transient elevations of blood pressure. As with motor movements evoked by cortical stimulation, these pressor responses can be facilitated or otherwise modified according to the type and characteristics of the stimulus and the state of the cortex itself at the moment of stimulation. Local application of aqueous solution of strychnine sulfate to an excitable focus on the left or right anterior sigmoid gyrus (in the pressor area) results within four to six minutes in greatly enhanced pressor responses not only from the strychninized focus, but also from the symmetrical focus on the opposite cortex. Experiments were designed to determine whether this facilitation of blood pressure responses from the pressor area of the cortex is derived from the localized action of strychnine at the application site, or whether it may be due to more generalized effects upon the excitability of the CNS as a result of absorption into the blood stream. An active pressor focus on the left anterior sigmoid gyrus was rendered unresponsive within approximately two to four minutes by local application of two per cent aqueous solution of Nupercaine on a piece of filter paper 5 mm. square. Application to the Nupercainized focus, immediately thereafter, of a 4 mm. square piece of filter paper soaked in two per cent strychnine sulfate did not restore the excitability of the focus nor result in any change in the pressor responses from the symmetrically placed contralateral non-Nupercainized focus, although this concentration and quantity of strychnine sufficed to facilitate responses when applied to non-Nupercainized foci. However, local application of a three per cent solution of strychnine sulfate to a Nupercainized focus was succeeded by facilitation of pressor responses from the opposite focus, although the Nupercainized, strychninized did not respond at all.

23. On Secondary Diaschisis and Secondary Release.

Walther Riese; *Medical College of Virginia.*

In unilateral brain lesions of great momentum such as apoplectic bleedings, injuries and rapidly growing tumors, ipsilateral paralysis is frequent, though, as a rule, incomplete. Neither pressure nor interruption of uncrossed cortico-spinal tracts can explain the transient character, the initial or exclusive appearance of ipsilateral paralysis, and the dissociation in physiological type between contralateral and homolateral paralysis. The symmetrical areas of the intact hemisphere are submitted to primary diaschisis or sudden arrest of nervous function which in its turn determines secondary diaschisis in lower levels of the opposite half of the body, thus, producing flaccid ipsilateral paralysis. If the primary diaschisis in the symmetrical cerebral areas does not wear off rapidly ipsilateral paralysis assumes the spastic type, due to the secondary release of the lower levels, having regained their function.

24. Streptomycin and Promizole Therapy in the Treatment of Tuberculosis in Children.

Lee E. Sutton, Jr., Kenneth D. Bailey, William M. Bruch, Franklin L. Angell, and Edwin L. Kendig, Jr.; *Medical College of Virginia.*

The case records and the results of therapy in the treatment of 16 patients with tuberculous meningitis are presented and 3 cases discussed in detail. Miliary tuberculosis was a primary factor in 10 of the cases.

Therapy consisted of dihydrostreptomycin (50 mgm./kg./i.m. daily) for periods as long as 6 months. Intrathecal streptomycin was administered in doses of 25-50 mgm. daily for 2 weeks — followed by 3 times weekly injections to a total of 40 injections. Individual response determined the need for repetition of this course of therapy. Promizole dosage was varied as indicated to maintain blood levels from 1-2 mgm.%.

The toxicity of the drugs used is discussed.

Five patients were treated terminally with less than 20 days survival in all cases. Four patients who received full courses of therapy expired while in the hospital. At present seven patients have survived for periods of from 3 months to 2½ years. The mortality rate for this study is 56.26% uncorrected and 36.36 corrected, if terminal cases are excluded. These statistics may be altered in the future by the cases that have been followed for only short periods of time.

Dihydrostreptomycin, streptomycin and promizole continue to be the available drugs of choice in the treatment of tuberculosis meningitis and miliary tuberculosis.

25. Function of the Adrenal Glands in Gravitational Shock.

E. G. Lewis and S. W. Britton; *University of Virginia Medical School.*

In the head-up position on the tilt-table, rats show considerable resistance and may survive for 12 to 48 hours. Struggling is observed for the first 1 or 2 hours, followed by torpidity. Various reflex activities, respiration, etc., are used as criteria of the animal's condition. In the first few hours hyperglycemia occurs followed by prolonged hypoglycemia. In tests made 1 to 7 days after bilateral adrenalectomy, marked sensitivity to the vertical posture was shown; some animals died within 1 hour, and most of the others became comatose or died within 2 hours. Operated rats treated with cortico-adrenal preparations showed resistance to gravity almost equal to normal animals. Adrenalin administration only slightly improved tolerance. On exposure to accelerations on the centrifuge, adrenalectomized rats showed extreme sensitivity; in 26 cases, 11 died and all others were comatose within 12 min. at 2 g. This was a relatively mild exposure for normal animals. Cats showed similar results to the above.

Minutes of the Section of Psychology [10]

JOHN N. BUCK, *Chairman*

FRANK W. FINGER, *Vice-Chairman*

STANLEY WILLIAMS, *Secretary*

RICHARD H. HENNEMAN, *Section Editor* (1954)

FRIDAY, MAY 12 — 8:45 A. M. — PINE ROOM

1. Psychology and Psychopathology of Reading Difficulties.

Hertha Riese; *Educational Therapy Center, Richmond.*

For more than six years observations with the poor reader were made of how children fail and how they compensate for failure. We distinguished a hypokinetic, rigid and a hyperkinetic child. This distinction has its practical implications in reading education. Both, the rigid and the hyperkinetic child appear to be stimulus bound.

While, as a rule children are prone to look into the vague, trying to recall the word image, so to say read it in their mind, the rigid child will resort to the groping procedure, a scarce and schematic experience, apparently poor in intuitive elements. This kind of experience cannot be well integrated. The usual reading methods fail here as they appeal to imagination and memory. Our teaching methods are based on insight into the mechanism of failure as well as on the assumption that the performance still possible represents the most adequate solution under the given condition. We thus, try to avail ourselves of the observed procedure and to use a system which requires a successive performance, and relies on facilitation rather than memorization. We appeal to less differentiated brain function, when indicated.

Our step by step procedure reduces the task at hand to a minimum which can be mastered by the child which is already assailed by stimulation. We observe that by this approach capacity for concentration on what is relevant increases as well as capacity for classification. We appeal to and encourage a certain amount of abstraction and the use of judgment. This is often carried over to general behavior.

2. Problems Encountered in Telegraphic Code Learning.

Raymond C. Bice; *University of Virginia.*

The fact that 30,000 men failed in radio operators schools during the war pointed to the need for careful analysis of the code learning process. A special technique, developed by the writer, is described. The method gives immediate information to the trainee when errors are made. The roles of proactive and retroactive inhibition are discussed. Practical considerations relative to training procedures are described.

3. The Effect of Drive Stimulus Discrimination Training Upon Generalization of Secondary Reinforcement.

A. J. Slivinske; *University of Virginia.*

In two recent studies, W. K. Estes has reported that the efficacy of a secondary reinforcing agent, established under one drive state, can be generalized to reinforce learning under a different drive state. In view of the difficulty with which animals are able to discriminate between stimuli associated with different drive states, the question can be raised, "Will secondary reinforcement generalize from one drive state to another to reinforce learning in animals who have been previously trained in a discrimination situation to make one response when hungry and another

response when thirsty?" Experimental design, procedure and results will be discussed.

4. Human Salivary Conditioning by the Razran Technique.

John W. McCrary, Jr.; *College of William and Mary.*

Razran's basic technique is briefly described, and data obtained from an exploratory experiment where use was made of a modification of this method are discussed. The need for intensive methodological examination is presented.

5. The Specific Hunger for Sodium Chloride in White Rats.

John K. Bare; *College of William and Mary.*

In order to account for specific hunger behavior, previous investigators had suggested that gustatory thresholds were lowered in a condition of need for a specific food substance. Using an electrophysiological recording technique, Bare and Pfaffmann were unable to show any such threshold change for sodium chloride in a condition of adrenalectomy. Bare further demonstrated that the specific hunger behavior occurred to some extent in normal as well as in adrenalectomized rats.

Three possible explanations of the behavior were proposed, the first making the behavior dependent upon primary reinforcement, the second on secondary reinforcement, and the third on an unlearned receptor-effector connection.

On the basis of the fact that the preference for saccharine over tap water could not be extinguished, as demanded by the primary reinforcement theorizing, it was proposed that secondary reinforcement was adequate to produce the behavior.

6. Types of Personal Adjustment Problems Leading to the Referral of War Veterans for Personal Therapeutic Counseling: An Analysis of 200 Cases.

John E. Partington; *Personal Counselor, Veterans Administration Regional Office, Roanoke.*

1. Two hundred cases of World War II veterans were studied with reference to the adjustment problems which led to their referral for personal therapeutic counseling. Three-fourths of these veterans were receiving compensation for a service-connected disability and the remainder had no disability.

2. Uncertainty of Aims and Purposes was the most frequent reason for the referral of veterans for personal therapeutic counseling (30.5%). Other Personal Problems, Failure to Adjust to the Job, and Worry and Feelings of Inadequacy were next in order.

3. The study suggests the following comments:

a. Vocational counseling which is made a part of the program of the public school may be one means of informing young people of their interests, aptitudes, and abilities and should be instrumental in eliminating uncertainty of aims and purposes from their vocational adjustment.

b. Early detection of maladjustment to the job seems essential to reducing job failure and job turnover.

c. Veterans with a neuropsychiatric disability seem to be adjusting as well as other veterans when it comes to dealing with personal problems of adjustment.

7. A Psychological Analysis of the Process of Communication.

Richard H. Henneman; *University of Virginia.*

The process of communication may be regarded as the exchange of information between persons. It is possible to break this process down into *sending, transmission,* and *receiving* phases in order to isolate the factors determining the efficiency of communication. The first and third of these phases are essentially psychological, i.e., involve human factor variables.

8. The Intelligibility of Highly Speeded Speech for Communication Purposes.

William D. Garvey; *University of Virginia.*

Using a previously reported technique of speeding up speech without attendent frequency shift, intelligibility tests have been run to determine the practical limits of speech speedup. Speeds up to three times the normal speaking rate have been studied and results comparing discrete words and continuous speech (i.e., sentences and questions) are reported.

9. The Effect of an Interfering Task on the Relative Intelligibility of Messages Presented Visually and Aurally.

T. L. Matthews; *University of Virginia.*

The experiments to be reported are part of a series of laboratory projects investigating the relative intelligibility of messages presented to subjects visually and aurally. Along with the type of message, as factors determining the superior sense channel for communication purposes, is the matter of what the subject is doing when the message is presented. The influence of two kinds of highly attention-demanding tasks upon intelligibility scores will be reported.

10. Visual Illusions in Night-Flying.

Henry A. Imus; *Office of Naval Research, Washington.*

Unusual aircraft accidents led to a long series of experiments on visual illusions which were thought to affect pilots in operating aircraft at night or under adverse conditions of visibility and weather.

A survey of experienced aviators revealed that such illusions were relatively frequent in occurrence.

Experiments on the autokinetic illusion indicated that this type of illusion could occur in night flying and could be reduced by increasing the number of formation lights on the planes, and by instructing pilots to shift their gaze.

Experiments in a Barany chair, a rotating Link Trainer and the Human Centrifuge indicated that acceleration and deceleration forces produce illusions of motion and displacement of visual targets. Other experiments on the human centrifuge show that gravitational forces cause displacement of visual targets and illusions of changes in bodily position. These experiments were confirmed by flights "under the hood" in a Naval training aircraft.

11. Cybernetics and Psychology.

W. F. Day; *University of Virginia.*

Cybernetics is a relatively new term, dating back only to 1947. It comes from a Greek word which means "steersman". An A.P.A. symposium on "Man as a Servomechanism" in 1948 pointed out important relationships among psychology, statistical mathematics, electrical engineering, and physiology. Though developed primarily from a mathe-

matical point of view, Cybernetics has already become the basis for much theory, especially as applied to communications engineering, automatic control mechanisms, and the human nervous system itself.

12. An Experimental Investigation of Kinaesthetic After-Effects.

Bertita Compton; *University of Virginia.*

This report will cover an investigation of kinaesthetic after-effects of weight and size. Techniques of investigation, especially control of variables, and results, will be discussed. The significance of the investigation relates to Kohler's findings on visual after-effects and their application to his "brain-field" theory.

13. Electrical Stimulation and Sensory Fatigue.

Jack A. Vernon; *University of Virginia.*

When weak electrical currents, alternating at audio frequencies, are applied to the human skin under controlled conditions, it has been discovered that the resulting sensation has a very short duration. The nature and course of the phenomena associated with sensory fatigue and the relationships that exist between these phenomena and the physical constants are discussed. These basic data are needed in considering an electrical means of communication making use of the skin as a receptor.

14. Basic Threshold Constants from Vibratory Stimulation.

Carl E. Sherrick; *University of Virginia.*

Precision apparatus has been built to make microscopic observations of vibrating stimulators applied to the human skin. Absolute thresholds, differential thresholds, and information about the skin as an elastic body in motion have been studied. A sinusoidal variation of intensity has been used to obtain highly accurate information on differential intensity thresholds. Basic data are needed in considering mechanical vibration as a means of communication.

15. The Effect of Auditory Stimulation Upon Vernier Acuity.

Henry R. Hortenstine; *University of Virginia.*

An experiment is described whereby the effect of auditory stimulation upon visual acuity for black objects viewed upon a white background is measured in terms of vernier acuity. Tentative results indicate that under certain conditions visual acuity will increase with auxiliary auditory stimulation.

16. A Comparison of the Relative Effectiveness of Several Methods of Presenting Tachistoscopic Materials.

Andrew William Gottschall, Jr.; *Washington and Lee University.*

Two basic procedures were conceived to be the primary "unknowns" regarding presentation of tachistoscopic materials in remedial reading work. Three groups of ten men each were equated on the basis of the Minnesota Speed of Reading Test Form A. Group A worked with material presented by the tachistoscope at a relatively high speed, 1/25th of a second, using first "5 digit" slides, then six digit slides. Group B worked with the tachistoscopic material using relatively long spans of digits (6) and an increasing speed of projection, from 1/10th to 1/25th of a second. Group C was the control group.

Form B of the Minnesota Speed of Reading was used in the attempt to answer the secondary problem: "Is there any, and if so how much, transfer to an actual reading situation and if there is transfer which of

the two basic approaches tends to transfer more readily to the reading situation."

The results tend to show that use of a constant speed of 1/25th of a second with increasing digit length (5 to 6 digits) is more efficient than the reverse of this procedure and that the greatest amount of transfer tends to occur with this procedure.

17. Some Additional Notes on a Case of Automatic Drawing.

William M. Hinton; *Washington and Lee University.*

The original report on the automatic drawing of "Mrs. Smith," an average appearing American woman of approximately fifty years of age, was made at the 1949 meeting of The Southern Society for Philosophy and Psychology. The present paper describes some of the original material plus other automatic drawing and writing activities.

A comparison is made between this case and similar cases reported in psychological literature. No interpretation is attempted since it is felt that an understanding of this type of phenomena can be obtained only through more detailed description and clinical study than has been accomplished at this time.

Minutes of the Section of Science Teachers [11]

L. W. JARMAN, *Chairman*
W. I. NICHELS, *Chairman-Elect*
ESTHER SHREVE RUFFIN, *Secretary*
L. W. JARMAN, *Section Editor* (1954)

FRIDAY, MAY 12 — 9:30 A. M. — BOARD ROOM, N. & W. OFFICE BUILDING

1. The Egg, The Sperm and I.

   G. W. Jeffers and Susie V. Floyd; *Longwood College* and *Newport News High School.*

By capitalizing upon the natural interests of high school pupils it is possible to banish much of the dullness that too frequently resides in the biology classroom. Biology abounds in 'liveliness', and the alert teacher can combine this vital quality of our science with the natural interests of young people without sacrificing essential content. A fundamental concept in biology is the cell principle; and young people are perhaps more interested in themselves than in anything else. Therefore, the study of *How We Inherit* is a 'natural'.

In the Newport News High School, biology is an elective subject with a satisfactory enrollment. Facilities and materials are not all that one might desire. There is no separate course or emphasis on sex education. In the regular biology course, the unit on heredity and reproduction has come to assume first-rate importance. Difficulties but no serious ones have been encountered although no topics are barred. On the other hand, sex is not overplayed, and care is taken to acquaint the school authorities with what is being attempted. There is much experimentation. Subject matter topics such as mitosis and meiosis are mastered. The interest generated is carried over into science club work and throughout the summer.

2. Demonstration of Inexpensive Equipment that Might be Used in a High School Physics Class.

   W. H. Keeble; *Randolph-Macon College.*

3. Some Concepts of Energy.

   John E. Reitz and Frederick L. Brown; *Lane High School* and *University of Virginia.*

The high school physics student has difficulty in mastering the proper concept of many familiar terms such as force, work, power and energy. Among these, energy in its different forms is one of the most difficult to grasp, in part, because most textbooks have a tendency to treat energy only as a definition and the different forms of energy as unrelated ideas or facts.

For this reason, "Energy" was chosen to illustrate two ways of correlating ideas or terms that seem to be entirely unrelated. First, using "Energy" as a "String", certain physical facts or ideas may be "strung" on it like so many "beads." The potential energy at the top of the waterfall becomes kinetic energy at the bottom to drive generators to produce electrical energy and so on. Stressing inter-relations of various kinds is like connecting the 'beads" by so many "strings" until they cease to be isolated facts and become part of a definite and interesting pattern.

A second suggestion was a double entry array using types of energy as heading of columns and also of rows. In the "boxes" so formed, one places the name of a machine — or a process that converts the type of energy of that particular row into the type listed in that column. Examples: Some photoelectric cells convert *light* energy into *electrical* energy. A microphone converts *sound* into electrical energy and so on, until as many "boxes" as possible are filled.

4. Demonstration of Inexpensive Equipment that Might be Used in a General Science Class in High School.

M. G. Gustaffson; *Swanson High School, Arlington.*

Minutes of the Section of Statistics [12]

W. A. HENDRICKS, *Chairman*
J. M. SYKES, *Vice-Chairman*
M. E. TERRY, *Secretary*
WALTER A. HENDRICKS, *Section Editor* (1954)

FRIDAY, MAY 12 — 9:45 A. M. and SATURDAY, MAY 13
PARLOR H

1. Opening Address.

   W. A. Hendricks; *United States Department of Agriculture.*

2. Approximations to Distribution Functions by Moments.

   L. Weiss; *University of Virginia.*

The set characteristic function for the set S is equal to one on S, zero elsewhere. For many sets the function can be expressed as an integral or a series, except at its points of discontinuity. Below, these points have the probability zero.

Let $g_{a\,b}(x)$ be the set characteristic function for the set $a < x < b$. If a and b are points of continuity of the cdf of X, $Eg_{a,b}(X) = P(a<X<b)$. If we express $g_{a\,b}(X)$ as a Fourier integral, and invert the order of integration, we get the familiar formula giving the cdf in terms of the characteristic function of the chance variable X. If X and Y are chance variables with a distribution such that (a,b) and (c,d) are continuity points of the marginal cdfs of X and Y respectively, then $P(a<X<b, c<Y<d) = Eg_{a\,b}(X).g_{c\,d}(Y)$, and expressing the g's as Fourier integrals and changing the order of integration, we get the expression for the probability in terms of the joint characteristic function of V and Y.

If we have chance variables bounded with probability one (without loss of generality we can assume the bounds are -1 and 1) we can express $g_{a\,b}(X)$ and $g_{c\,d}(Y)$ as series in Legendre polynomials, and taking expectations as above, we get expressions for the probabilities in terms of the moments. If density functions exist we can get convenient bounds for the error committed in stopping at the N'th term of the series.

3. Some Difficulties Encountered in Teaching Elementary Courses in Statistical Methods.

   Alonzo M. Myster; *Virginia State College.*

In this paper an attempt is made to show the necessity of offering courses in statistical methods to students who are lacking in mathematical background. Some difficulties encountered in teaching elementary courses in this field to students who do and who do not possess a good mathematical background are indicated. Finally, some suggestions for overcoming these difficulties are presented.

4. Prediction Problems.

   Glenn W. Suter; *Virginia Polytechnic Institute.*

Scientific sampling procedures were applied to 326 area segments throughout the state of Virginia in 1949. Each county within the state was sampled at the rate of about one farm in eighty. On the farms within the segments, one sample of corn was taken for every 10 acres of corn for grain. This design gave 1271 samples in the state, taken from 825 farms. Using a series of weights the average yield per acre for corn was calculated along with cultural practices. As the samples were taken

before time of harvest, the predicted harvest of corn for grain was estimated for the state. Cost factors for this type of prediction is high but the degree of accuracy has justified the amount of expenditure.

5. Sampling Approximations to Non-Null Distributions for Small Samples.

Frederick W. Cleaver; *Virginia Polytechnic Institute.*

A sampling approximation to the Standard Normal Curve may be obtained by the following formula:

$$N_i = N\left(\int_{-1}^{1} \phi(t)\,dt\right)\left(\int_{-26}^{27} \phi(t)\,dt\right)^{-1}, \quad -26 \leq i \leq 27$$

where N_i is the number of balls in the ith class interval when $i > 0$ and the number of balls in the $(i + 1)$ st class interval when $i < 0$ and where $\phi(t)$ is the integrand of that function of "t" that gives the normal curve over this interval, and where N is the number of balls in the population.

If two such populations are sampled simultaneously, a non-null distribution may be obtained if to each value drawn from one population an arbitrary amount is added.

By using such distributions the relationship between efficiency of some of the rank order statistics and differences in means was obtained for samples of 3 and 3. This relationship may be expressed as

$$Y = 29.54X - 1.15$$

where Y is the efficiency, and X is the difference in means of the two populations. This relationship will hold up to the 2 standard deviation limit.

6. Use of Multiple Regression Methods in Studies of Dairy Pedigrees.

N. R. Thompson; *Assistant Dairy Husbandman, Virginia Polytechnic Institute.*

It is desirable to evaluate the potential breeding value of young dairy bulls as early as possible. Pedigrees of these young bulls usually contain information on the milk and butterfat production of their ancestors. We may, from studies of the pedigrees of older bulls and the performance of their daughters, secure an estimate of the usefulness of pedigrees in predicting the performance of the daughters of young bulls.

Details on the procedure may be found in various textbooks of statistical methods. The mimeographed article by Paul Peach (Institute of Statistics, Raleigh, N. C.) on "The Abbreviated Doolittle Method for Matrix Inversion" describes a comparatively rapid method for inverting the matrix of simple correlation coefficients which are secured from the first step of the procedure.

The end results include (1) a multiple correlation coefficient which shows the combined relation of the performance of the bulls' daughters to the information in the pedigree, (2) standard partial regression coefficients which enable the various items in the pedigree to be compared and to be tested individually for significance, and (3) an equation which may be used for predicting the performance of a young bull's daughters from the information in his pedigree.

7. On a Statistical Problem of Fisheries.

E. L. Cox; *North Carolina State College.* (Presented by title.)

8. Some New Light on an Old Problem of Statistical Inference.

Herbert Robbins; *University of North Carolina.*

A classical problem of statistical inference is that of deciding, on the basis of random samples, whether there is significant difference between the means of two normal populations having a comm n variance. The two-sample t test solved this problem.

From the point of view of testing hypotheses the t test is quite satisfactory. In practice, however, one usually wants to know what course of action should be taken after the experiment to achieve the maximum success. In the present case, for example, a farmer might ask, on the basis of field trials of two varieties, what proportion of his future acreage should be planted to each variety in order to maximize the expected total yield. If the t test is indecisive, the farmer would be left to his own resources.

Recent work of Bahadur and the speaker has shed light on this decision problem. It turns out that, under hypotheses which are likely to hold in practice, the farmer would do well to plant all his land to the variety with the greater sample mean, whether or not the difference between the means is significant according to the t test. This paper outlines the justification for this simple decision rule, and indicates certain situations where it is not to be recommended.

9. Certain Problems in Aviation Medicine.

Dorothy Morrow Guilford; *Civil Aeronautical Administration, Washington, D. C.* (Introduced by M. E. Terry.) (Presented by title.)

10. A Note on Tukey's Separation of Varietal Means.

Milton E. Terry; *Virginia Polytechnic Institute.*

Tukey's article, "Comparing individual means in the Analysis of Variance" gives a method for selecting treatments or groups of treatments which show real differences. This method has been used with success in the laboratory at V.P.I. However, it was soon discovered that subgroups would emerge where Variance Ratio Tests of these subgroups with the Error Mean Square would be highly significant and yet no "straggling mean" or "excessive gap" could be found. This note demonstrates the existence of such subgroups.

1. $\sqrt{2}\, s_m t_\alpha$ where s_m is root mean sq. error, t_α is the critical value of Student's t at αth level for m degrees of freedom.

Consider now a subgroup of n treatments, $\mu + x_i$, $i = 1, 2, \ldots\ldots, n$, where $\Sigma x_i = 0$

2. $s_g^2 = 1/n - 1(\Sigma x_i^2)$

Then 1 and 2 yield the following two conditions on Σx_i^2:

Condition 1: $x_i^2 \leq 2.s_m^2.t_\alpha^2$ for all i, $m \geq n$, or

$\Sigma\, x_i^2 \leq 2ns_m^2 t_\alpha^2$; and

Condition 2: $\Sigma x_i^2 = (n-1)s_m^2\, F_\alpha$ where F_α is the critical value at the αth level of the variance ratio with n-1 and m degrees of freedom.

These two conditions may hold simultaneously for they imply:

$(n-1).s_m^2.F_\alpha < 2ns_m^2.t_\alpha^2$ or

$F_\alpha < 2n/n\text{-}1\ t_\alpha^2$ which may hold for $n > 1$.

11. Some Examples of Sampling Techniques Applied to Bureau of Agricultural Economics.

G. Burroughs; *United States Department of Agriculture.* (Presented by title.)

12. A Problem of Many Missing Values.

T. Shien; *Virginia Polytechnic Institute.*
(Read by M. F. P. Nightingale.)

Last year a simple 4 by 6 factorial design to study the effects of curing systems on tobacco was carried out. Four curing systems and 6 primings were used. Out of the total 24 observations for this experiment 9 were lost due to unforeseen circumstances. Solutions for these missing values were obtained by the method of minimization of the sums of squares due to error with respect to each unknown in turn. Thus, 9 equations in 9 unknowns were obtained, which, on being solved, gave the solutions for each unknown value as a function of the observed block and column totals.

13. Designs in Chemistry.

W. J. Youden; *Bureau of Standards, Washington, D. C.*

The error in a measurement depends upon the equipment, the observer, and various uncontrolled environmental conditions. The equipment may be a composite assembly of two or more major units. If two complete assemblies are available and measurements made with each assembly, and then an additional series of measurements made after an interchange of units comprising the assemblies, it is possible to isolate the contribution made by each unit to the error in the measurement. If two operators are available the operators may take turns on each piece of equipment. This will make it possible to ascertain whether or not the observer makes a contribution to the error. The segregation of the error components due to equipment and to the observer will leave a residual error which reflects the impact of uncontrolled conditions upon the measuring process.

14. The Effect of Sulfamerazine on the Erythrocyte and Hemoglobin Content of Trout Blood.

James S. Gutsell; *U. S. Department of the Interior, Fish and Wildlife Service, Microbiological Laboratory, Kearneysville, W. Va.*

In the Leetown experiment to test the effects of sulfamerazine (used in the treatment of furunculosis) on trout, daily rates of 0, 5, 10, 15 grams per 100 pounds of fish were given (in the diet) to rainbow (1946), brook (1946) and brown (1947) trout through more than six weeks. With brown trout, hemoglobin measurements and erythrocyte counts were made after 35 (hemoglobin) and 42 (erythrocytes) days. Surprisingly their concentration was found to be higher in fish on diets including the drug. Analysis of variance clearly indicates that the general increase was due to the sulfonamide in the diet and suggests that the highest level of hemoglobin and of red cells was due to the particular dosage rate (5 gram) involved. Some possible explanations of the increase are given and the lack of anemic effect noted as a partial explanation of the apparent lack of injurious effect from heavy and long continued dosage with sulfamerazine.

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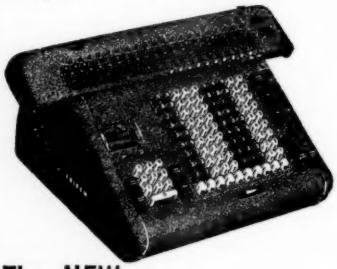

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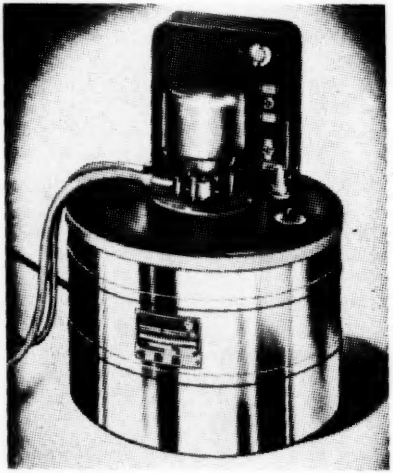

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Parkhurst, Dr. R. T., 1 .....702 Shenandoah Ave., N.W., Roanoke
Parkins, John H., 5 .....288 Bank St., Norfolk
Parrott, W. T., 8 .....2905 W. Grace St., Richmond 21
Partington, John E., 10 .....1708 Dudding St., Raleigh Ct., Roanoke
†Patterson, Dr. Paul M., 4 .....Hollins College
Paxton, Earl K., 2 .....Box 754, Lexington
Payne, John T., 10 .....State Hospital, Morgantown, N. C.
†Peabody, Dr. William A., 5, 9 .....2510 Howthorne Ave., Richmond
Peachee, C. A., Jr., 10 .....Drawer 1080, Staunton
Pederson, P. M., 5, 2, 7, 12 .....4011 Crutchfield St., Richmond 24
Peery, Dr. G. G., 4 .....310 High St., Salem
Pegau, Dr. A. A., 8 .....Va. Geol. Survey, Box 1428, University
Pence, Col. J. Worth, 11, 6 .....Box 116, Kable Station, Staunton
Perry, Miss I. Blairyne, 4 .....Huntington High School, Newport News
Pertzoff, Dr. V. A., 2 .....Keelona, Carter's Bridge
Petterson, Olga M., 9 .....Box 727, MCV Station, Richmond
Pettigrew, T. P., 5 .....1015 W. 47th St., Richmond 25
Pfeiffer, Norman B., 8, 1 .....Chase City
Phalen, Prof. H. R., 2 .....130 Chandler Ct., Williamsburg
Phillips, Dr. E. Lakin, 10 .....310 Riley St., Falls Church
Phillips, Dr. W. J., 4, 1 .....718 Cargil Lane, Charlottesville
Pierce, Dr. J. Stanton, 5 .....813 Roseneath Rd., Richmond
Pinchbeck, Dr. Raymond B., 6 .....University of Richmond
Pincus, Dr. Albert, 9 .....Cent. Nat. Bank Bldg., Richmond

Pitt, Miss Lyndele A., 4 ..... 4303 New Kent Ave., Richmond 24
Pittman, Dr. Melvin A., 2 ..... Madison College, Harrisonburg
Pitts, Prof. Frank P., 5 ..... Med. Col. of Va., Richmond
Pletta, D. H., 7 ..... Dept. of Aplied Mechanics, V.P.I., Blacksburg
Porter, H. C., 8 ..... Leesburg
†Porter, Dr. William B., 9 ..... Medical College of Va., Richmond
Porterfield, B. O., 1 ..... Fincastle
**Powers and Anderson ..... 603 E. Main St., Richmond
†Pownall, L. H., 5, 7 ..... American Viscose Corp., Roanoke
Pritchard, D. W., 5, 4, 2 ..... Chesapeake Bay Institute, Johns Hopkins, Baltimore 2, Maryland
Pullen, Edwin W., 4 ..... Apt. A-8, Univ. Gardens, Charlottesville
Pulliam, Miss Elizabeth, 3 ..... 2814 Hawthorne Ave., Richmond 22
Pyle, Robert W., 4 ..... Box 1931, College Sta., Fredericksburg

QUAN, Mrs. Alice Lee, 3 ..... 1725 DeSales St., N.W., Washington, D. C.
Quinn, I. T., 4 ..... 7 North Second St., Richmond

RAMSEY, Dr. Robert W., 9 ..... MCV Station, Richmond
*Randolph-Macon Woman's College ..... Lynchburg
Rayburn, Dr. C. H., 5 ..... 5215 Devonshire Rd., Richmond
Raynor, Prof. C. H., 2 ..... Box 589, Salem
Reed, Charles L., 2 ..... c/o Larus & Bros. Co., Inc., Box 6-S, Richmond
Reed, Garland L. ..... C-419 Edsdale Rd., Baltimore 29, Md.
*Reed, P. L. ..... 1418 Grove Ave., Richmond
Reed, W. D. ..... 3609 Military Rd., N. W.,, Washington 15, D. C.
Reid, Dr. Douglas, 3 ..... University Heights, RFD 13, Richmond
†Rein, Dr. Walter J. ..... 501 East Franklin St., Richmond
Reitz, John E., 4 ..... 1414 Gordon Ave., Charlottesville
*Rennie, C. Bruce, 1, 7, 5 ..... Box 1998, Richmond
Reynolds, Dr. Bruce D. ..... University
Reynolds, Emmett D., 1 ..... Blacksburg
Rhodes, K. Blair, 2 ..... Physics Dept., U. of Pitt., Pittsburg, Pa.
Rich, Dr. Gilbert J., 10 ..... 1912 Memorial Ave., S.W., Roanoke
Richardson, Andrew G., 5 ..... 16 N. 22nd St., Richmond
Ridley, Walter N., 10, 6 ..... Va. State College, Petersburg
Riese, Dr. Hertha, 10 ..... 203 North Lombardy St., Richmond
Riese, Dr. Walter, 9 ..... Medical College of Va., Richmond
†Risley, Miss A. Marguerite, 2 ..... Box 63, R-M W. College, Lynchburg
Ritchey, Col. H. E., 5 ..... 213 Maiden Lane, Lexington
Robb J. Bernard ..... c/o A.B.C. Board, Drawer 1395, Richmond
Roberts, D. B., 7, 10, 6, 2 ..... Route 3, Box 261, Norfolk 6
Roberts, Dr. Joseph K., 8 ..... Box 1471, University
Roberts, Walter C., 5 ..... Alumni Hall, V.M.I., Lexington
Robertson, Dr. D. S., 8 ..... School of Geology, University
Robeson, Dr. F. L., 2 ..... Blacksburg
Robey, Dr. Ashley, 5 ..... P. O. Box 421, Salem
Rogers, D. A., 1, 5 ..... The Solvay Process Co., Hopewell
Romaine, Dr. Charles N., IV, 9 ..... 503 Professional Bldg., Richmond 19
Roome, Prof. W. G., 2 ..... 48 Polk St., Monroe Terrace, Radford
Roseberry, Dean A., 4 ..... Com., Game & Inland Fisheries, Richmond
Rosenweig, Abraham L., 3 ..... Veterans Admin. Hosp., Richmond 19
Rosser, Dr. Charles M., 5 ..... 1606 Franklin St., Fredericksburg
Rosser, Shirley E., 2 ..... 3405 Memorial Ave., Lynchburg
Row, Dr. Stuart B., 5, 7 ..... American Viscose Corp., Roanoke 7
**Rucker, Dr. M. Pierce, 9 ..... 1238 Rothesay Rd., Richmond 21
Ruffin, Mrs. Esther Shreve, 5, 11 ..... 610 Arlie St., Richmond 28
Runk, B. F. D., 4 ..... Box 1728, Univ. Sta., Charlottesville
Rush, Richard M., 5 ..... Cobb Chemical Lab., University
Russell, Miss Frances H. ..... 212 N. Market St., Staunton

Ryman, Jacob F., 2 ..... 504 N. Main St., Blacksburg
Rymarkiewsowa, Mrs. Dorota, 10 ..... Box 613, Main St. Station, Jacksonville, Fla.

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†Scherer, Dr. J. H., 9 ..... 820 W. Franklin St., Richmond
Scherer, Dr. Philip C., Jr., 5 ..... Box 80, Blacksburg
Schoenbaum, Alexander W., 5, 7 ..... 3102 French St., Richmond
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Scott, Dr. A. P., 9 ..... Allied Arts Bldg., Lynchburg
Scott, Fontaine, H., 1 ..... Dept. of Horticulture, Blacksburg
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Sears, C. E., Jr., 8, 7 ..... Box 522, Blacksburg
Sharpley, J. M., 3 ..... 3141 Griffin Ave., Richmond 22
Shawver, M. C., 4 ..... Box 278 Madison Col., Harrisonburg
Shear, Dr. G. M., 4, 1 ..... Box 112, Blacksburg
Shelburne, Tilton E., 7, 8 ..... Thornton Hall, University
Sheldon, Frank, 2 ..... R.P.I., 901 W. Franklin St., Richmond
Sheppard, Dr. L. Benjamin, 9 ..... 301 Medical Arts Bldg., Richmond
Sheppe, Robert Leon, 7 ..... Thornton Hall, University
Sherwood, C. S., III, 5, 6, 8 ..... 111 West Rd., Portsmouth
Shields, Prof. A. Randolph, 4 ..... Box 113, Emory
Shields, Dr. James Asa, 9 ..... 212 W. Franklin St., Richmond
Sholes, Dr. Dillard M., Jr., 5, 9 ..... St. Elizabeths Hospital, Elizabethton, Tenn.
Shomon, Joseph J., 4, 6 ..... 826 E., 45th St., Richmond
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Sitterson, Miss Louise, 11 ..... 118 Warren St., Apt. 1, Norfolk
Skinner, W. French, 3, 9 ..... State Health Dept., State Office Bldg., Richmond
Skowlund, Miss Helen, 9 ..... Med. College of Va., Richmond
†Smart, Dr. Robert F. ..... Box 108, University of Richmond

Smith, Bessie S., 10 ..... 26 Elm Ave., Hilton Village
*Smith, Dr. D. C. ..... University of Virginia Hospital, Charlottesville
†Smith, Foley F., 5, 9, 1 ..... Box 1395, Richmond
Smith, G. Pedro, Jr., 5, 2, 7 ..... Cobb Chemical Lab., University
†Smith, Dr. James H., 9 ..... 1008 W. Grace St., Richmond
Smith, Dr. J. Doyle, 5 ..... Med. College of Va., Richmond
Smith, Dr. Leroy, 9 ..... 617 W. Grace St., Richmond, 20
†Smith, LeRoy H., 5, 7, 6 ..... American Viscose Corp., Roanoke
Smith, Mary Ellen, 1, 4 ..... 203 Washington St., Blacksburg
Smieszko, Dr. S. F., 3, 4 ..... Kearneysville, W. Va.
Snyder, Glenn J., 10 ..... Warren County High School, Front Royal
Sommerville, Dr. R. C., 10 ..... 307 Vernon St., Lynchburg
Southward, Ronald W., 5 ..... 3922 W. Franklin St., Richmond
Southward, Dr. W. R., Jr., 9 ..... 3922 West Franklin St., Richmond
Spalding, Dr. Henry C., 9 ..... 820 W. Franklin St., Richmond
Speck, Mrs. Miriam Partridge, 10 ..... 2732 Wilson Blvd., Arlington
Speidel, Dr. Carl C., 9, 4 ..... 1 West Lawn, University
Spencer, Dr. Hugh M., 5 ..... Cobb Chemical Lab., University
Sprague, Elizabeth F., 4 ..... Sweet Briar College, Sweet Briar
Stahl, Glenn W., 5 ..... Mill and Brewood Place, Camden, S. C.
Starling, Dr. James, 4 ..... Main St., Lexington
Stephenson, William J., 8, 7, 4 ..... 4825 North Lane, Bethesda, Md.
Stern, Dr. E. George, 7 ..... Box 361, Blacksburg
Stetson, Dr. John M., 2 ..... 232 Jamestown Rd., Williamsburg
Stetson, Mrs. J. M., 4 ..... 232 Jamestown Rd., Williamsburg
Stevens, Miss Eleanor B., 11, 2, 5, 4 ..... Foxcroft School, Middleburg
Stevens, Dr. Kenneth P., 9, 4 ..... 7 University Place, Lexington
Stewart, Prof. Josephine, 4, 2, 3, 9 ..... Radford College, Radford
Stiff, McHenry Lewis, III, 4 ..... 1310 Meadow St., Roanoke
Stipe, Dr. J. Gordon, Jr., 2 ..... R-M Womans College, Lynchburg
Stirewalt, Margaret A., 4 ..... 1300 Maine Ave., S.W., Washington, D. C.
Stowe, Robert G., 2 ..... Route 1, Box 451, Clinton, Md.
†Stow, Dr. Marcellus H., 8 ..... 405 Morningside Heights, Lexington
*Strauss, Lewis L., 2, 1, 9 ..... 15 Broad St., New York City, N. Y.
Strickland, Dr. John C., 4 ..... Biology Dept., University of Richmond
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Stutzman, Karl aH., 2 ..... 6103 Patterson Ave., Richmond 21
Sullivan, Miss Anne, 10 ..... 3305 W. Grace St., Richmond 21
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Suter, Glenn W., 12 ..... Statistical Lab., V.P.I., Blacksburg
†Sutton, Dr. Lee E., 9 ..... 1200 E. Broad St., Richmond 19
Swasey, Paul F., 2 ..... Tunstall
*Sweet Briar College ..... Sweet Briar
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Swertferger, Dr. Floyd, 6, 10 ..... Longwood College, Farmville
Sykes, John M., 12 ..... 2216 Brandon Ave., S.W., Roanoke
Szebehely, V. G., 7 ..... Applied Mechanics Dept., V.P.I., Blacksburg

TALBERT, Mrs. Rosalie R., 4—
U. of Wisconsin, Dept. of Zoology, Madison, Wis.
Tanner, Mrs. Agnes Vicars, 11, 4 ..... Box 429, Victoria
Taussig, Miss Herta, 2 ..... Hollins College, Hollins
Taylor, Eugene R., 5 ..... 737 Arnold Ave., Richmond
Taylor, Henry M., 12 ..... 1027 State Office Bldg., Richmond
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Thiers, Dr. Ralph E., 5 ..... Cobb Chemical Lab., University
Thomas, Dr. Minor Wine, 10, 6 ..... Radford College, Radford
Thomasson, C. L., 11 ..... 134 College Ave., Danville
†Thompson, Dr. Dudley, 5, 7 ..... Dept. of Chem. Eng., Blacksburg
Thompson, Dr. Lorin A., 10 ..... 703 E. Jefferson St., Charlottesville
Thompson, M. Weldon, 6 ..... Lynchburg College, Lynchburg
Thompson, Norman R., 4 ..... Dept. Animal Husbandry, VPI, Blacksburg
*Thomsen, Dr. Lillian, 4 ..... Mary Baldwin College, Staunton
Thornton, James E., 4 ..... Com. of Game and Inland Fisheries, Richmond
Thornton, Dr. Nan V., 5 ..... Box 292, R-M Woman's Col., Lynchburg
†Thornton, Dr. S. F., 1 ..... Box 479, Norfolk
Thurlow, Dr. Williard R., 10— Psychology Dept., Peabody Hall, Charlottesville
Tiedjens, Dr. Victor A., 1, 4, 5 ..... Box 2160, Norfolk
Todd, R. G., 5 ..... A.B.C. Board, Box 1395, Richmond
Toone, Dr. Elam C., Jr., 9 ..... 1200 E. Broad St., Richmond
Trainer, Frank W., 8 ..... 71 Oxford Ave., Cambridge 38, Mass.
Trattner, Dr. Sidney, 9, 4, 3 ..... 1210 Confederate Ave., Richmond
Trout, Dr. William E., Jr., 5 ..... Box 64, University of Richmond
Truitt, Prof. R. W., 7 ..... 116 Lake Boone Trail, Raleigh, N. C.
†Turman, Dr. A. E., 9 ..... 20 W. Grace St., Richmond
†Turner, Dr. J. V., Jr., 9 ..... 804 Professional Bldg., Richmond
Turner, Dr. Thomas W., 1 ..... Hampton Institute, Hampton
Turner, Walter L., Jr., 1 ..... 707 N. Main St., Blacksburg
Tyler, George W., 12, 2 ..... Naval Electronics Lab., San Diego 52, Cal.
Tyler, Dr. Gilman R., 9 ..... 810 W. Franklin St., Richmond

UNDERHILL, G. W., 4 ..... 200 Washington St., Blacksburg
Underhill, Dr. T. A., 9 ..... 301 E. Franklin St., Richmond
*The University of Richmond ..... University of Richmond
*University of Virginia ..... University
Updike, Dr. I. A., 5, 6 ..... P. O. Box 667, Ashland
Updike, Mrs. I. A., 5, 6 ..... P. O. Box 667, Ashland
Updike, Dr. O. L., Jr., 7, 5 ..... Thornton Hall, University
Ussery, Hugh D., 2 ..... Box 187, Blacksburg

†VALENTINE, C. Braxton, 5, 9 ..... Box 1214, Richmond
Valentine, Granville G., Jr., 5, 9, 3 ..... Box 1214, Richmond
VanAlstine, J. N., 8 ..... P. O. Box 141, New Castle
Van Engel, Willard A., 4 ..... Va. Fisheries Lab., Yorktown
Vass, Miss Thelma Gene, 9 ..... Box 726, Coalwood, West Va.
Venable, Douglas, 2 ..... 44 University Circle, Charlottesville
†Vilbrandt, Dr. Frank C., 7, 5 ..... Box 126, Blacksburg
Vincent, Dr. Sybil H., 6 ..... Longwood College, Farmville
Vingiello, Dr. Frank A., 5 ..... Chem. Dept., V.P.I., Blacksburg
Vinzant, J. Paul, 5 ..... Box 4178, Richmond
*Virginia Military Institute ..... Lexington
*Virginia Polytechnic Institute ..... Blacksburg
von Elbe, Dr. Guenther, 5 ..... U.S. Bureau of Mines, Pittsburgh, Pa.
Vyssotsky, Dr. Alexander N., 2 ..... Box 1535, University

WAKE, Orville W., President, 6 ..... Lynchburg College, Lynchburg
Walker, Dr. Paul A., 4 ..... 339 Woodland Ave., Lynchburg
Walker, Phelps, 1 ..... 514 Progress St., Blacksburg
Walker, R. J., 9, 1, 6 ..... 2901 West Ave., Newport News
Wall, Mrs. W. Gernon, 11, 5 ..... Route 1, Box 205, Radford

Waller, Robert K., 9 ..... MCV Station, Richmond
Wallerstein, Dr. Emanuel U., 9 ..... Prof. Bldg., Richmond
†Walton, Benjamin F., 6 — Supt. of Schools, Brunswick County, Lawrenceville
Walton, Miss Harriett M., 114 ..... St. Catherine's School, Richmond
Walton, Dr. Leon J., 9 ..... 713 Shenandoah Life Bldg., Roanoke
Walton, Miss Lucile, 4 ..... 1116 E. Main St., Danville
Walton, Miss Margaret, 4 ..... 1116 E. Main St., Danville
†Ward, L. E., Jr., 1, 7 ..... c/o N and W Ry. Co., Roanoke
Warren, Dr. Charles R., 8 ..... Davidson Park Apts., Lexington
Warren, Dr. Percy H., 4 ..... Madison College, Harrisonburg
Wartman, William B., Jr., 5 ..... 601 Roseneath Rd., Richmond 21
Wash, Dr. A. M., 9 ..... Medical Arts Bldg., Richmond
*Washington and Lee University ..... c/o Marcellus H. Stow, Lexington
Watkins, Miss M. A., 11, 2 ..... 1151-40th St., Newport News
Watkins, Peter H., 5, 3 ..... c/o Chem. Eng. Dept., V.P.I., Blacksburg
Watson, Dr. John W., 5 ..... Box 75, Blacksburg
Watson, Dr. William L., 1 ..... Box 27, Va. State College, Petersburg
Watts, Daniel T., 9 ..... Box 1264, Medical School, University
Weaver, Col. R. C., 2 ..... 303 Letcher Ave., Lexington
Weiss, Lionel, 12 ..... Dunnington House, U. of Va., Charlottesville
Weiss, Otto H., 2 ..... Box 669, Newport News
Wells, John C., 2, 11 ..... Madison College, Harrisonburg
West, Warwick R., Jr., 4 ..... White Hall
Westbrook, Dr. C. Hart, 10 ..... 3230 Patterson Ave., Richmond 10
Wetzler, Dr. Wilson F., 10, 6 ..... 348 College St., Lynchburg
Wheeler, Dr. Charles H., III, 2, 12 ..... University of Richmond
Whidden, Miss Helen L., 5, 2 ..... R-M Woman's Col., Lynchburg
White, Miss Irene Estelle, 5 ..... MCV Station, Richmond
White, Dr. O. E., 4, 1 ..... Blandy Experimental Farm, Boyce
White, Willard H., 12 ..... 1010 Foxcroft Rd., Richmond
*Whitehead, W. M., 6 ..... Virginia State School, Hampton
Whitehurst, Miss K. E., 10 ..... Va. State College, Petersburgh
Whitehurst, Walter R., Jr., 4 ..... 7 Valley Circle, Charlottesville
Whyburn, G. T., 2 ..... 133 Bollingwood Rd., Charlottesville
Wilfong, Dr. R .E., 5, 12 ..... 904 Spring Hill Rd., Staunton
Wilkerson, Emery Coles, 2 ..... Prospect
Wilkinson, C. W., 11, 4 ..... Rt. 2, Box 284-AA, Portsmouth
Williams, Carolyn, 5, 9 ..... 3418 Hawthorne Ave., Richmond
**Williams, Dr. Carrington, 9 ..... 805 W. Franklin St., Richmond 20
Williams, Miss Elizabeth R., 10 ..... Box 476, Hollins College
**Williams, E. Randolph ..... Va. Elec. & Power Bldg., Richmond
**Williams, Lewis C., 6, 12, 10 ..... 1001 E. Main St., Richmond
Williams, Prof. Marvin Glenn, 4, 8 ..... Bluefield College, Bluefield
Williams, Dr. Myra A., 4, 9 ..... 14 N. Laurel St., Richmond
Williams, Dr. Stanley B., 10 ..... Col. of Wm. & Mary, Williamsburg
Williams, Walter J. ..... 1109 W. Grace St., Richmond
Wilson, Dr. David C., 9 ..... University Hospital, University
Wilson, Dr. E. Justin, Jr., 2, 5, 7 ..... 417 Christopher Rd., Richmond 21
Wilson, Dr. I. D., 9, 4, 1 ..... V.P.I., Blacksburg
Wiltshire, Mrs. James W., Jr., 4— Box 221, R-M Woman's College, Lynchburg
Wingard, S. A., 4, 1 ..... Box 425, V.P.I., Blacksburg
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Wood, Alonzo E., Jr., 12 ..... 2327 Harrell Ave., Norfolk 2
Wood, John Thornton, 4, 6, 11 ..... Va. Fisheries Lab., Yorktown
Woodside, A. M., 4 ..... 9 Bagby St., Staunton
Woodward, J. B., Jr., Pres. and Gen. Mgr., Newport News Shipbuilding and Dry Dock Co., Newport News

†Worsham, James E., Jr., 5, 2 ....Box 4968, Duke Station, Durham, N. C.
Wrenn, J. Sol, Jr., 6 .....4902 Old Brook Rd., Richmond 21
Wright, H. E., Jr., 5 .....4505 Augusta Ave., Richmond 21

YATES, Dr. Harry B., 10 .....Box 1021, University
Yates, Mrs. Mary Stewart, 10 .....Box 1021, University
Yoe, Dr. J. H., 5 .....Cobb Chemical Lab., University
Young, Dr. H. N., 1 .....Va. Agri. Exp. Station, Blacksburg
Youden, Dr. W. J., 12 ....Natl. Bur. of Standards, Washington 25, D. C.

ZEHMER, George B., 6 .....Extension Division, University
Zimmerman, Henry D., 5 .....2410 Lakeview Ave., Richmond

Student Members

1950-51

ABBOTT, Betty J., 4 ..... 105 Leslie St., Williamson Rd., Roanoke 12
Alluisi, Earl A., 10 ..... 115 West 11th Ave., Columbus, Ohio
Andrews, Miss Janice A. ..... Riverside Apt., Radford
Ashman, Stuart, 10 ..... General Delivery, Williamsburg

BALLENTINE, George Y., Jr., 2 ..... 211 Palen Ave., Hilton Village
Banks, Richard G. ..... University Station, Box 1635, Charlottesville
Baxter, Donald L., 9 ..... 2009 West Grace St., Richmond
Black, Robert A., 5 ..... 207 Monte Vista Ave., Charlottesville
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Burch, John Bayard, 4 ..... 18 Veterans Village, R-M Col., Ashland
Burns, James R., 8 ..... Box 1541, School of Geology, University
Byrd, Mitchell A., 4 ..... Box 5223, Tech Station, Blacksburg

CALIGA, Charles F., 8 ..... School of Geology, University
Campbell, Macon, 5, 9 ..... 3220 Memorial Ave., Lynchburg
Carper, Marshall J., 9 ..... Box 351, MCV Station, Richmond 19
Casey, Sylvia, 9 ..... Box 163, Raven
Childers, Aldena, 4 ..... Box 373, Radford College, Radford
Chilton, John M., 5 ..... Box 1342, University Station, Charlottesville
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Corel, Joann, 4 ..... Box 394, Radford College, Radford
Cosby, Lynwood A., 2 ..... 2101 E. Marshall St., Richmond
Cousins, Thomas Edward, Jr., 5..... Route 14, Box 171, Richmond 23
Cox, Patsy Ann, 2, 5 ..... Radford College, Radford
Craver, Clifford E., 11, 10 ..... 7315 Woodfin Ave., Norfolk
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DAMSON, Miss Margaret, 9, 10, 4 ..... St. Paul
DaVault, Donald E., 4 ..... Box 1085, Williamsburg
Davidson, Miss Gladys, 10 ..... Hollins College
Dickerson, C. L., 5 ..... Box 1174, Williamsburg
Dillon, Martha Anna, 4 ..... Box 371, Radford College, Radford
Dovel, Anne H., 5 ..... Box 432, Madison Col., Harrisonburg
Dunn, Joseph J., 8 ..... 4835 — 24ht Road, North Arlington

ENGLE, JAMES W., JR., 4, 1 ..... Box 5325, Tech. Sta., Blacksburg

FANNEY, Julius H., Jr., 3, 5 ..... Box 173, University of Richmond
Fentress, Miss Joyce, 5 ..... Princess Anne
Fish, Miss Shirley, 10 ..... Box 146, Radford Col., Radford
Flewellen, Barbour, H., 8 ..... 632 Evergreen Ave., Charlottesville
Flora, Betty Jane, 9 ..... Route 4, Rocky Mount
Forkgen, Peter, 8 ..... Sigma Nu House, Lexington
Fortna, John D. E., 2 ..... 3013 Seminary Ave., Richmond

GOTTSCHALL, ANDREW, JR., 10 ..... Box 55, W & L, Lexington
Graham, Charles J., 4, 5 ..... Box 291, Bridgewater Col., Bridgewater
Grant, W. F., 4 ..... Blandy Exp. Farm., U. of Va., Charlottesville

HAMILTON, C. S., 9, 5 ..... Box 467, MCV Station, Richmond 19
Hargis, Wm. J., Jr., 4 ..... 6222 Ellis Ave., Richmond 22
Harnsburger, William T., 8 ..... School of Geology, University
Hart, C. W., Jr., 4 ..... 1005 High St., Farmville
Hay, N. R. T., 8 ..... Four Winds, Mendham, N. J.
Hegwood, Miss Muriel, 4 ..... 402 Randolph St., Radford
Hinkle, Barfton L., 5, 7 ..... 114 Robertson Ave., Charlottesville
Howren, Harry Hubert, Jr., 9 ..... 3522 Hanover Ave., Richmond
Hull, Alexander P., Jr., 5 ..... Box 25, Charlottesville
Humann, A. Dawn, 10, 2 ..... Box 101-A, Radford College, Radford
Humphris, C. C., 8 ..... East Lexington
Hunt, W. H., 8 ..... Beta Theta Pi House, Lexington
Hutton, Daniel Cogdell, 10 ..... Colony
Hyde, A. T., Jr., 4 ..... 1 Stadium Road, Charlottesville
Hyson, R. W., 8 ..... Box 907, Lexington

INGE, Patricia T., 10 ..... "Ingemont", Blue Ridge

JENNINGS, Lloyd H., 10 ..... 1310 Radcliffe Ave., Lynchburg

KEMPF, James F., 8 ..... Box 1733, University
Kiracofe, James L., 5 ..... Route 1, Box 352, Norfolk
Kraus, Frederick, 5, 4 ..... Box 1461, Williamsburg

LESTER, John C., Jr., 1 ..... V.P.I., Blacksburg
Logan, John B., 5 ..... 144 Hunt Ave., Pearl River, N. Y.
Lunsford, Carl D., 5 ..... 2113 2nd Ave., Richmond
Lyle, Richard E., 5 ..... 119 Bay State Road, Boston, Mass.
Lyons, Gloria, 5, 4 ..... Box 24, St. Paul

MAHLOY, John D., 2 ..... 88 Hopkins St., Hilton Village
Martin, Miss Angie, 4 ..... Radford College, Radford
Martin, Warren C., 10 ..... 215 Vernon Ave., Lynchburg
Matthews, Thomas L., 10, 9 ..... Psychology Dept., University
Maxey, Ellis F. ..... RFD 2, Rustburg
McCrary, John W., Jr., 10 ..... Col. of Wm. and Mary, Williamsburg
McDonald, R. R., 8 ..... 521 Jackson Ave., Lexington
McFadden, Samuel E., Jr., 4 ..... Biology Dept., University
Miller, B. W., 8 ..... Box 1109, University
Mills, Wm. A., 2 ..... 2508 High St., Lynchburg
Mitchell, Fred N., 4 ..... 514 Hawthorn Lane, Charlotte, N. C.
Moller, Miss Julie Clara, 4, 9 ..... Westhampton Col., Univ. of Richmond
Moore, Clarence V., Jr., 8 ..... 1633 Stuart Ave., Petersburg
Morrison, Miss Carole, 4, 9, 3 ..... 209 Baldwin St., Radford
Moseley, Dorothy Ann, 4 ..... Box 387, Radford Col., Radford
Moseley, Edward C., 10 ..... 201 Cherry Ave., Hampton

NIDAY, Miss Martha A., 5, 4 ..... Radford College, Radford
Nigg, Miss Patricia A., 10 ..... Lynchburg State Colony, Colony

O'DELL, Herman, 4 ..... c/o Dean Lewis, 11 E. Lawn, Charlottesville
Offenbacker, Robert Earl, 2 ..... 1509 Hampton Avenue, Roanoke
Overton, Walter S., Jr., 4 ..... V.P.I., Blacksburg

PAFFORD, Phil T., 5 ..... 4319 Chamberlayne Ave., Richmond
Paris, Charles E., 2 ..... 1316 St. Cloud Ave., Lynchburg
Parsons, James S., 5 ..... 11 Gordon St., Lynchburg
Perkins, H. K., 10 ..... 2425 New Berne Road, Richmond
Pettus, William G., 2 ..... 2001 Grace St., Lynchburg
Porter, John B., 4 ..... 708 Kenbridge Rd., Lynchburg
Porterfield, Mary Nancy, 4 ..... Radford College, Radford
Price, Jack, 8 ..... 400 High St., Salem

QUARLES, E. B., Jr., 5 ..... Altavista
Quick, Miss Janice, 4 ..... Box 1035, Williamsburg
Quynn, Richard G., 2, 5 ..... 2-B Graduate Col., Princeton, N. J.

RAMSEY, Elmer W., 8 ..... Apt. 5-C, Copley Hill, Charlottesville
Ramsey, Menger, M., 8 ..... 126 Observatory Ave., Charlottesville
Reams, W. M., Jr., 4 ..... 1323 Bainbridge St., Richmond
Rivera, Joan Ellen, 4 ..... Radford College, Radford
Roberts, George K., 2 ..... 1307 S. Main St., Harrisonburg
Rose, Nancy Grey, 4 ..... 1120 Grove Ave., Radford
Rosenberger, Edward S., 11 ..... 604 Madison St., Lynchburg
Rucker, John Blair, 5 ..... 327 Warwick Lane, Lynchburg
Rush, Marshall W., 10 ..... 212 Harrison St., Lynchburg
Russell, Miss Catherine, 4 ..... Miller School of Biology, University
Russell, Robert L., Jr., 6 ..... 32 E. Copeley Hill, Charlottesville

SABOL, Anna, 2, 9 ..... 102-A Radford College, Radford
Seelinger, J. G., Jr., 10 ..... 2706 Barton Ave., Richmond
Sheppe, Walter A., 4, 8, 3 ..... 245 Henry St., Williamsburg
Sherrick, Carl E., 11 ..... Psychology Lab., University
Sinker, Frances G., 5, 4 ..... Box 122 Radford College, Radford
Slirinske, Alec J., 6 ..... Copeley Hill, Apt. 27-D, Charlottesville
Sloope, Billy W., 2 ..... 1311 Westmoreland Ave., Norfolk
Smith, Fred S., 6 ..... P. O. Box 268, Ashland
Smith, Hester M., 4 ..... Box 371, Radford
Smith, Olivia H., 2 ..... 1218 Clement St., Radford
Somers, Miss Mary, 9 ..... Radford College, Radford
Spangler, Martin, 5, 2 ..... Box 334, Bridgewater Col., Bridgewater
Sprunt, Alexander, IV, 4 ..... c/o Mrs. W. H. Byrne, Blacksburg

Stickle, W. F., 8 ..... 14 Jordan St., Lexington
Sykes, James E., 4 ..... 32 M. Copeley Hill, Charlottesville

TABOR, William R., 9 ..... 1604 Wilmington Ave., Richmond
Thornton, Charles P., 8 ..... 7 Peters Hall, University
Tolley, Stephen William, 2 ..... 1705 Main St., Lynchburg
Toso, Lorraine, 4 ..... Radford College, Radford
Turner, Edward F., Jr., 2 ..... Apt. 4-D, Davidson Park, Lexington
Tweedy, Betty Sue, 9 ..... Box 277, Radford College, Radford

USHER, Miss Rosemary Holmes, 10 ..... Hollins College

WADE, Miss Gene, 5, 2 ..... 1014 Pechin Ave., Roanoke
Wendt, Frank Starr, 2 ..... 4207 Monument Ave., Richmond
Whitson, R. E., 8 ..... 15-C Hillside Terrace, Lexington
Will, Fritz, III, 5 ..... 3913 Floyd Ave., Richmond
Wills, Wirt H., 4 ..... 1667 Monticello Ave., Petersburg
Wingeld, Edward C., 2, 1 ..... RFD 2, Charlottesville
Wolfe, Jamie Robert, 5 ..... Glade Springs
Wright, Charles N., 5 ..... 901 Euclid Ave., Lynchburg
Wyatt, Mrs. Kathleen, 11 ..... Clifton Forge

YOUNG, R. S., 8 ..... University of Virginia, Charlottesville

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